

1. Subbasin Assessment – Watershed Characterization

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 USC § 1251.101). States and tribes, pursuant to section 303 of the CWA are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses the water bodies in the South Fork Salmon River Subbasin that have been placed on what is known as the "303(d) list."

1.1 Introduction

In 1972, Congress passed public law 92-500, the Federal Water Pollution Control Act, more commonly called the Clean Water Act. The goal of this act was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Water Pollution Control Federation 1987). The act and the programs it has generated have changed over the years as experience and perceptions of water quality have changed. The CWA has been amended 15 times, most significantly in 1977, 1981, and 1987. One of the goals of the 1977 amendment was protecting and managing waters to insure "swimmable and fishable" conditions. This goal, along with a 1972 goal to restore and maintain chemical, physical, and biological integrity, relates water quality with more than just chemistry.

Background

The federal government, through the U.S. Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the country. The Idaho Department of Environmental Quality (DEQ) implements the CWA in Idaho, while the EPA oversees Idaho and certifies the fulfillment of CWA requirements and responsibilities.

Section 303 of the CWA requires DEQ to adopt, with EPA approval, water quality standards and to review those standards every three years. Additionally, DEQ must monitor waters to identify those not meeting water quality standards. For those waters not meeting standards, DEQ must establish TMDLs for each pollutant impairing the waters. Further, the agency must set appropriate controls to restore water quality and allow the water bodies to meet their designated uses. These requirements result in a list of impaired waters, called the "303(d) list." This list describes water bodies not meeting water quality standards. Waters identified on this list require further analysis. A subbasin assessment and TMDL provide a summary of the water quality status and allowable TMDL for water bodies on the 303(d) list. The *South*

Fork Salmon River Subbasin Assessment provides this summary for the currently listed waters in the South Fork Salmon River Subbasin.

Idaho's Role

Idaho adopts water quality standards to protect public health and welfare, enhance the quality of water, and protect biological integrity. A water quality standard defines the goals of a water body by designating the use or uses for the water, setting criteria necessary to protect those uses, and preventing degradation of water quality through antidegradation provisions.

The state may assign or designate beneficial uses for particular Idaho water bodies to support. These beneficial uses are identified in the Idaho water quality standards and include:

- Aquatic life support – cold water, seasonal cold water, warm water, salmonid spawning, modified
- Contact recreation – primary (swimming), secondary (boating)
- Water supply – domestic, agricultural, industrial
- Wildlife habitats, aesthetics

The Idaho legislature designates uses for water bodies. Industrial water supply, wildlife habitat, and aesthetics are designated beneficial uses for all water bodies in the state. If a water body is unclassified, then cold water and primary contact recreation are used as additional default designated uses when water bodies are assessed.

A subbasin assessment entails analyzing and integrating multiple types of water body data, such as biological, physical/chemical, and landscape data to address several objectives:

- Determine the degree of designated beneficial use support of the water body (i.e., attaining or not attaining water quality standards).
- Determine the degree of achievement of biological integrity.
- Compile descriptive information about the water body, particularly the identity and location of pollutant sources.
- When water bodies are not attaining water quality standards, determine the causes and extent of the impairment.

The SF Salmon River is a tributary to the Salmon River in Central Idaho. The Salmon River, as a tributary to the Snake River, represents a significant portion of the Columbia River system. The SF Salmon basin is part of the Idaho Batholith. This region is characterized as

predominantly forested and mountainous, with steep slopes, variable topography and highly erosive soils.

The SF Salmon River Subbasin, encompasses an area of 840,000 acres on the Boise and Payette National Forests (USDA Forest Service, 2000). The basin contains approximately 875 road miles.

The Northern Rockies Ecosystem covers most of central and northern Idaho. The main characteristics of the ecosystem in the SF Salmon River drainage consists of several conifer cover types, shrubs typically alder, huckleberry, spiera, willows and grasses. Land uses include forestry, grazing, mining, and recreation. The dominant land management agency within the SF Salmon basin is the USDA Forest Service. Isolated private land holding and a few areas managed by the Idaho Department of Lands (IDL) and the Bureau of Land Management (BLM) are also present. A few grazing allotments are present within the basin and are administered by the USDA Forest Service. Mining activities primarily occur around the town of Yellow Pine and Stibnite. Recreation includes hiking, camping, rafting, backpacking, fishing and hunting.

The SF Salmon Subbasin is a 5th-order river system that flows predominately north into the main stem of the Salmon River (Figure 1). The State of Idaho has split the stream system within the SF Salmon HUC into 35 water bodies (Tables 2 and 3).

The approved 1998 303(d) list for Idaho included eight water bodies located within the SF Salmon Subbasin. The pollutants of concern for these water bodies are included in Table 4.

None of the water bodies listed on the 1998 303(d) list (Table 4) had a full water body assessment completed prior to the submittal of the 1998 303(d) list. Therefore, this SBA is the first time the support status and attainment of water quality standards has been comprehensively reviewed. Results of the water body assessments contained within this document are to be used by the Department of Environmental Quality and the USEPA to update the 303(d) list for the State of Idaho.

Table 2. SF Salmon Water Body Identification Numbers

Water Body	Water Body ID	Aquatic Life ¹	Recreation ²	Other ³
SF Salmon River - EF Salmon River to mouth	S-1	COLD SS	PCR	DWS SRW
Raines Creek - source to mouth	S-2	COLD SS	PCR	
Pony Creek - source to mouth	S-3	COLD SS	PCR	
Bear Creek - source to mouth	S-4	COLD SS	PCR	
Secesh River - confluence of Summit Creek and Lake Creek to mouth	S-5	COLD SS	PCR	DWS SRW
Lake Creek - source to mouth	S-6	COLD SS	PCR	
Summit Creek - source to mouth	S-7	COLD SS	PCR	

Loon Creek - source to mouth	S-8	COLD SS	PCR	DWS SRW
Lick Creek - source to mouth	S-9	COLD SS	PCR	
SF Salmon River - source to EF of the SF Salmon River	S-10	COLD SS	PCR	
Fitsum Creek - source to mouth	S-11	COLD SS	PCR	
Buckhorn Creek - source to mouth	S-12	COLD SS	PCR	
Cougar Creek - source to mouth	S-13	COLD SS	PCR	
Blackmare Creek - source to mouth	S-14	COLD SS	PCR	
Dollar Creek - source to mouth	S-15	COLD SS	PCR	
Six-bit Creek - source to mouth	S-16	COLD SS	PCR	
Trail Creek - source to mouth	S-17	COLD SS	PCR	
Rice Creek - source to mouth	S-18	COLD SS	PCR	DWS SRW
Cabin Creek - source to mouth	S-19	COLD SS	PCR	
Warm Lake	S-20	COLD SS	PCR	
Fourmile Creek - source to mouth	S-21	COLD SS	PCR	
Camp Creek - source to mouth	S-22	COLD SS	PCR	DWS SRW
EF of the SF Salmon River - source to mouth	S-23	COLD SS	PCR	
Caton Creek - source to mouth	S-24	COLD SS	PCR	DWS SRW
Johnson Creek - source to mouth	S-25	COLD SS	PCR	
Burntlog Creek - source to mouth	S-26	COLD SS	PCR	
Trapper Creek - source to mouth	S-27	COLD SS	PCR	
Riordan Creek - source to mouth	S-28	COLD SS	PCR	
Sugar Creek - source to mouth	S-29	COLD SS	PCR	
Tamarack Creek - source to mouth	S-30	COLD SS	PCR	
Profile Creek - source to mouth	S-31	COLD SS	PCR	
Quartz Creek - source to mouth	S-32	COLD SS	PCR	
Sheep Creek - source to mouth	S-33	COLD SS	PCR	
Elk Creek - source to mouth	S-34	COLD SS	PCR	
Prophyry Creek - source to mouth	S-35	COLD SS	PCR	

¹COLD = Cold Water Biota, SS = Salmonid Spawning.

²PCR = Primary Contact Recreation.

³DWS = Drinking Water Source; SRW = Special Resource Water.

Table 3. Elevation and Drainage Areas of SF Salmon Tributaries

Water Body ID ¹	Water Body Name	Lowest Elevation (m)	Highest Elevation (m)	Mean Elevation (m)	Drainage Area (Ac)
2	Raines Creek	775	2525	2125	6938
3	Pony Creek	925	2475	2200	10111

4	Bear Creek	1050	2600	2325	9274
6	Lake Creek	1850	2675	2400	25610
7	Summit Creek	1850	2625	2375	8875
8	Loon Creek	1700	2850	2500	10219
9	Lick Creek	1250	2825	2425	19731
11	Fitsum Creek	1175	2750	2300	17927
12	Buckhorn Creek	1200	2750	2325	28161
13	Cougar Creek	1225	2675	2300	8861
14	Blackmare Creek	1300	2675	2350	10244
15	Dollar Creek	1500	2475	2225	9566
16	Six-Bit Creek	1550	2475	2250	7460
17	Curtis Creek	1575	2450	2200	15924
18	Rice Creek	1675	2700	2425	5802
20	Warm Lake	1625	2550	2225	5334
20	Warm Lake Creek	1550	2650	2175	13808
21	Fourmile Creek	1275	2800	2450	8885
22	Phoebe creek	1225	2300	2025	4008
24	Caton Creek	1350	2800	2500	15754
26	Burntlog Creek	1625	2800	2500	28277
27	Trapper Creek	1600	2600	2375	4816
28	Riordan Creek	1550	2775	2500	13062
29	Sugar Creek	1825	2850	2575	10418
30	Tamarack Creek	1700	2800	2525	10668
31	Profile Creek	1625	2825	2500	11335
32	Quartz Creek	1550	2725	2475	11042
33	Sheep Creek	1075	2700	2350	14709
34	Elk Creek	950	2800	2450	25350
35	Porphyry Creek	800	2750	2350	20035

¹Water bodies 1, 5, 10, and 25 are mainstem sections of the SF Salmon River, EF SF Salmon River, and Johnson Creek and are not included here.

Table 4. Water Bodies and Pollutants of Concern Identified on the 1998 303(d) List

Stream	Pollutant
SF Salmon River	Sediment
EFSF Salmon River	Sediment and Metals (Unknown)
Johnson Creek	Sediment
Rice Creek	Sediment
Dollar Creek	Sediment
Trail Creek	Sediment
Trout Creek	Sediment
Tyndall Creek	Sediment

1.2 Watershed Characteristics

Climate

Mean annual temperature varies throughout the watershed. At the Big Creek Summit monitoring site (elevation 6,580 feet) average daily maximum temperature is 63 F, minimum is 14 F and mean average is 37 F (Figure 2). At Yellow Pine (elevation 5,070 feet) average daily maximum is 54.6 F, minimum is 23.6 F, and mean average is 39.1 F. Frost can occur any day of the year at elevations greater than 7,000 feet.

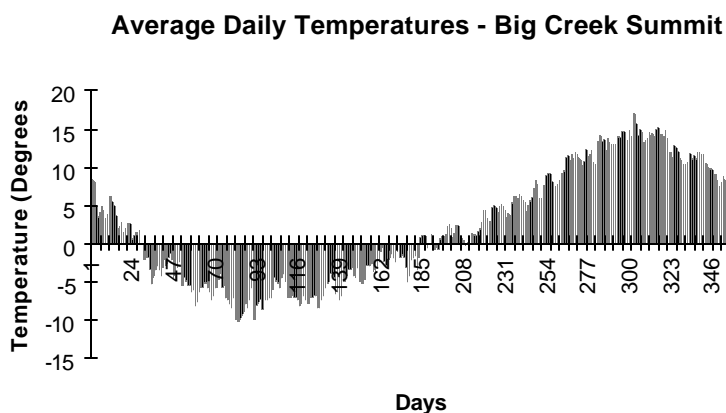


Figure 2. Average Daily Temperatures - Big Creek Summit*

*Day 1 beginning October 1st (water year).

Precipitation averages about 31 inches per year, falling mostly as snow (Figure 3). Heaviest precipitation usually falls as snow in November and December from maritime low-pressure systems. Occasionally, subtropical Pacific storms move over the area producing warm rainstorms in late fall or early winter (Kuzis, 1997). These storms can cause significant rain-on-snow events, resulting in high flows. The largest rain on snow event on record occurred from December 21, 1964 to mid-January 1965 when 4.53 inches of precipitation fell, mostly as rain. This event was similar to a 30-40 year storm event.

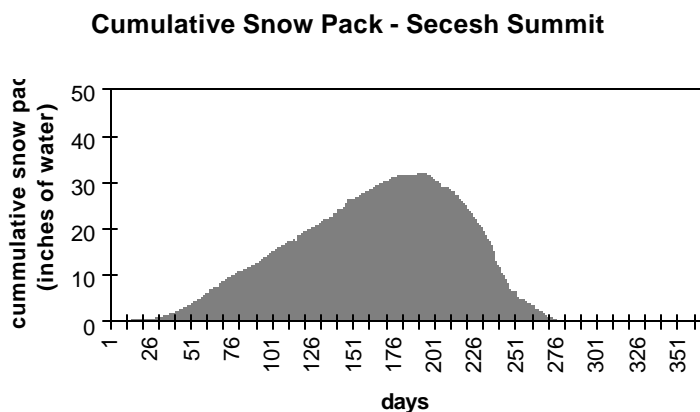


Figure 3. Cumulative Snow Pack - Secesh Summit*

*Day 1 beginning October 1st (water year).

During the summer, low-pressure systems from the Pacific can move into western Idaho, producing moderate rainfall events. These events are generally limited to sporadic thunderstorms, which may be associated with localized high intensity rainstorms of short duration over small areas. Mean annual precipitation increases with elevation and ranges from about 18 inches at lower elevations to 27.6 inches at Yellow Pine, 49 inches at Big Creek Summit (Figure 4) and 58.3 inches at Deadwood Summit (Kuzis, 1997).

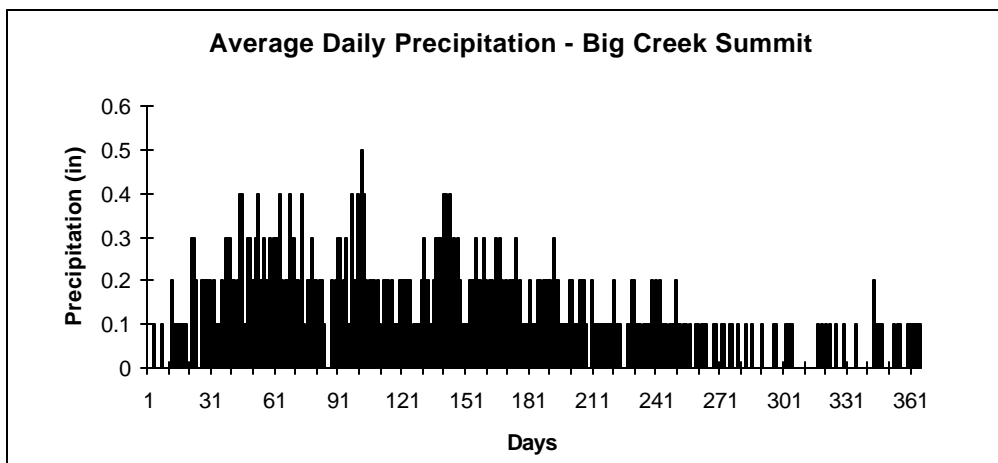


Figure 4. Average Daily Precipitation - Big Creek Summit*

*Day 1 beginning October 1st (water year).

Geology and Soils

The SF Salmon River basin is comprised of ancient sediments metamorphosed by magma introduced 80-100 million years ago. The basin is also located on the western edge of a 40 million-year-old volcanic center. Within this complex system there are three general lithologic units, metamorphic rocks, granite rocks and volcanic rocks (Figure 5).

Oldest in the basin is the metamorphic rock dating back several hundred million years. These rocks are thought to have been deposited as sedimentary or volcanic rock along an ancient ocean or river (USDA Forest Service, 2000). Over time the original sediments were changed into metamorphic rock by magma and deposition. The metamorphic rock is the most mineral rich type of rock in the basin, consisting of calcium-rich rocks, quartz-rich rock, mica-rich rocks and metamorphosed volcanic rocks. Volcanic rocks were formed by the Thunder Mountain Caldera 40 million years old. These rocks range from hard tuffs created by re-melted and re-crystallized lava to soft un-cemented ash and pumice (USDA Forest Service, 2000).

The 'Idaho Batholith' is comprised of granite rocks created by intrusions of magma 80-100 million years ago. The Batholith runs from the Idaho City area north to the Clearwater drainage. Within the watershed the rocks vary in composition, with three general types, true granites, granodiorites and tonalites. The 'typical' pink-colored granite is the predominate rock found. The granodiorites and tonalites are essentially the same being comprised of more calcium and magnesium (USDA Forest Service, 2000).

The soils of this basin are derived from the Idaho Batholith, which underlay approximately 16,000 square miles of central Idaho (USDA Forest Service, 2000). Soils from the batholith are in general poorly developed with low natural fertility and water-holding capacity. High erosion is due to low silt and clay content creating a sandy soil.

Erosion in this Subbasin is a combination of several factors including, geographic position, slope gradients, surface roughness and vegetation cover. Soils such as that found in the SF Salmon River basin have moderate to moderately high erosion due to shallow soils of 20 inches or less to bedrock. There are three types of erosion process occurring in the Subbasin, surface erosion, mass erosion/ mass failures and erosion associated with stream channel morphology (USDA Forest Service, 2000)

Soil particles that become detached from the land surface by water and gravity is surface erosion. Human disturbances such as mining and roads can increase erosion and sediment production. Soil Surface cover is a critical factor in the rate of surface erosion (USDA Forest Service, 2000). In areas where the vegetation has been removed such as fires erosion can increase in rate and severity. The ability of eroded material to move is a function of the energy available for sediment transport, the potential for storage on the slope, the volume of material, moisture content and the particle size distribution (USDA Forest Service, 2000).

Mass erosion/mass failure is when large masses of soil along with rock and organic material are displaced. Debris flows of this kind in granitic soil usually occur during high intensity rainstorms or seismic events. "Large-scale mass failures such as bedrock slumps and slides are often associated with geologic structures (faults, jointing) lithologic contacts and lithology (weathering conditions)" (USDA Forest Service, 2000). Seismic activity within the Subbasin has been on the moderate level in the Modified Mercalli scale.

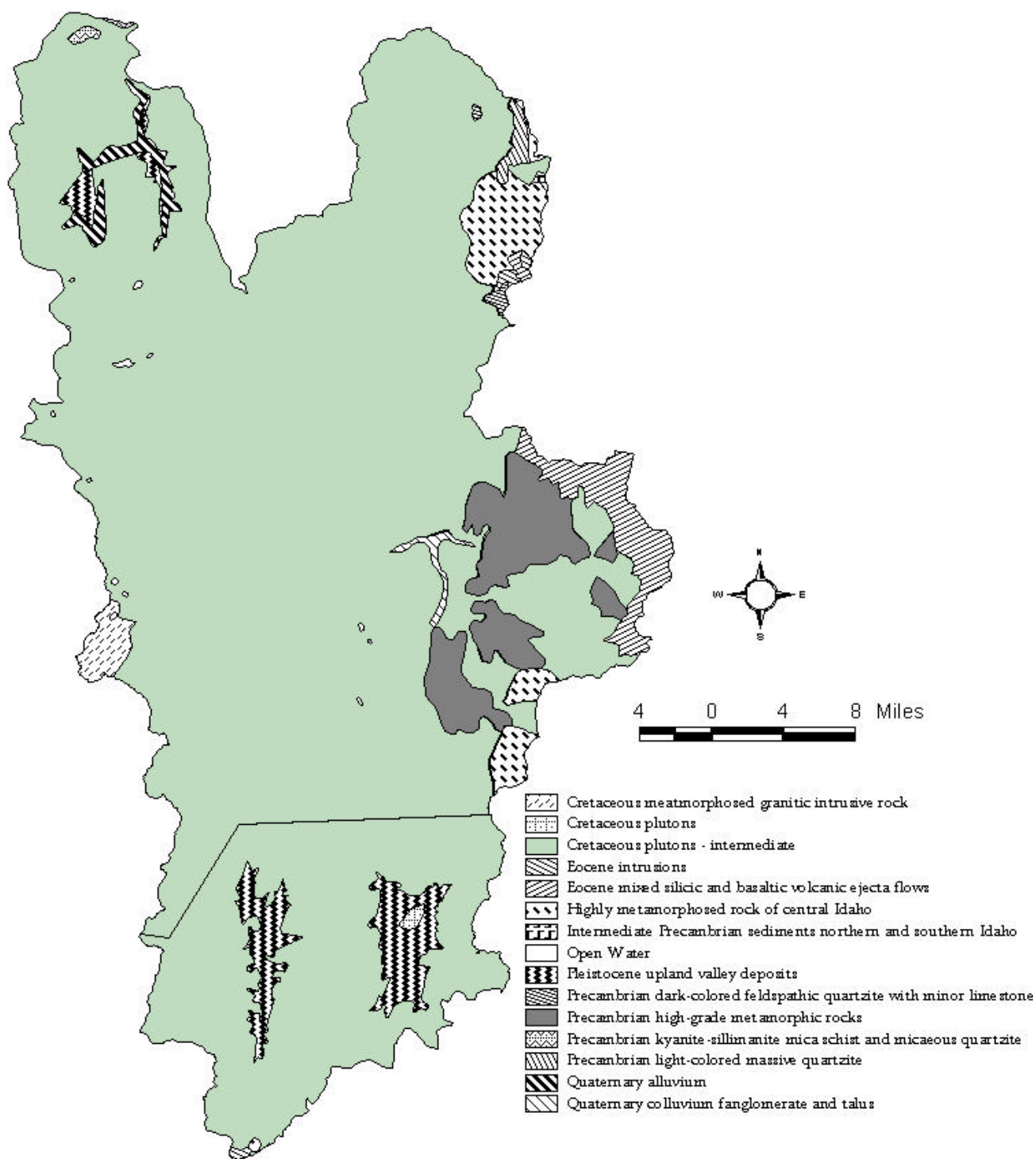


Figure 5. SF Salmon Geology

Land Use and Ownership

Land ownership in the SF Salmon River watershed is primarily public with less than 2% of the land in non-forest service ownership. The SF Salmon River Subbasin is largely made up of inventoried roadless areas, all of which have wilderness potential under the Wilderness Act of 1964. The US Forest Service principally administers the land uses within the SF Salmon Subbasin. The BLM administers the Marshall Mountain Mining District in the upper Secesh River. This district is only a small percentage of the total land in the Subbasin. The state lands are made up of the 'school' sections given to states and homesteads that the state has purchased. Private land is scattered throughout the watershed and includes working ranches, guest ranches, private residences, recreational facilities, villages and mining sites. Figure 6 and Table 5 shows land ownership throughout the SF Salmon Subbasin. Figure 7 shows land use throughout the SF Salmon Subbasin. Figure 8 shows wilderness areas within the SF Salmon Subbasin.

Current land uses falls mainly in the following categories: mining, timber harvest, grazing and recreation. Previous to 1831, land use in the sub-basin was by the Nez Perce and Shoshone Bannock tribes for hunting, gathering, fishing and spiritual uses. Table 6 shows a historical summary of human use.

Forestry

Timber harvest has occurred historically but is not currently widespread. Recent harvests include the 1996 helicopter harvest of a 250 acre parcel of private land on Profile Creek and post-1994 fire killed tree harvests from 1996-1999 (USDA Forest Service, 2000). Intense logging activity took place from 1950 to 1965 in the Subbasin. An estimated 147 million board feet was removed at that time. Concerns over sedimentation and fish habitat resulted in the Forest Service halting all land disturbing activities in the upper SF Salmon River drainage in 1965.

Between 1977 and 1982, timber harvest was allowed in the SF Salmon drainage as long as an annual review of monitoring results showed that fish habitat was continuing to improve. The Bear Creek, Roaring Creek, and part of the Cain Creek sales were harvested on the Cascade Ranger District during this period. However, another moratorium occurred from 1986-1988 due to no improvement in fish habitat. Although timber management activities occur within the Subbasin, timber sales have been limited to sales of utility poles, house logs, post and poles and fuel harvest.

While the moratorium affected timber harvest within the Subbasin, it is the roads built during harvest activities and retained for recreation and fire suppression that have been the dominant sources of erosion in the SF Salmon watershed. One analysis, for example, indicates that, cumulatively, roads have contributed 97% to management induced sediment in the SF Salmon River and 90% to Johnson Creek (USDA Forest Service, 1995).

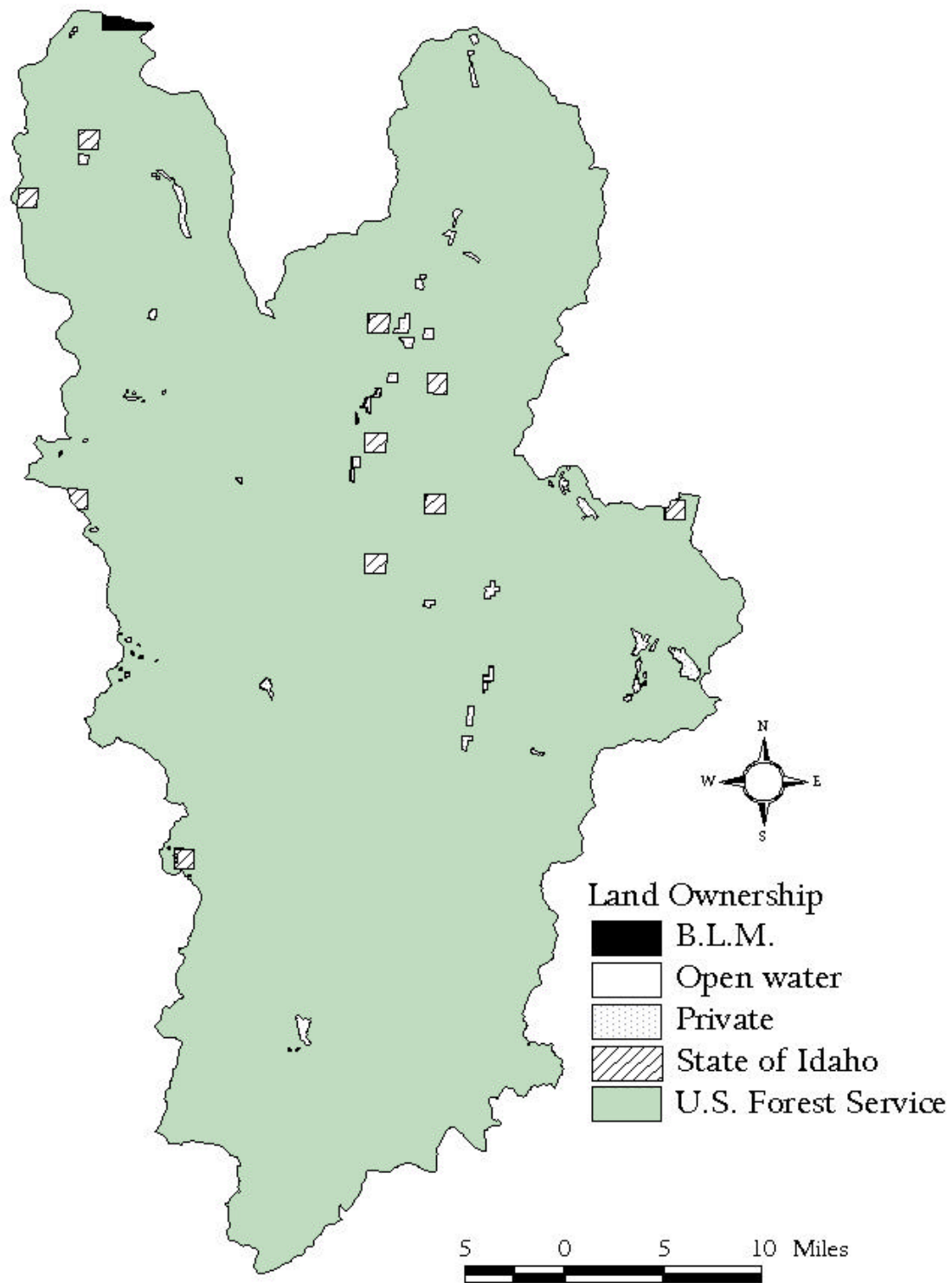


Figure 6. Land Ownership within the SF Salmon Subbasin

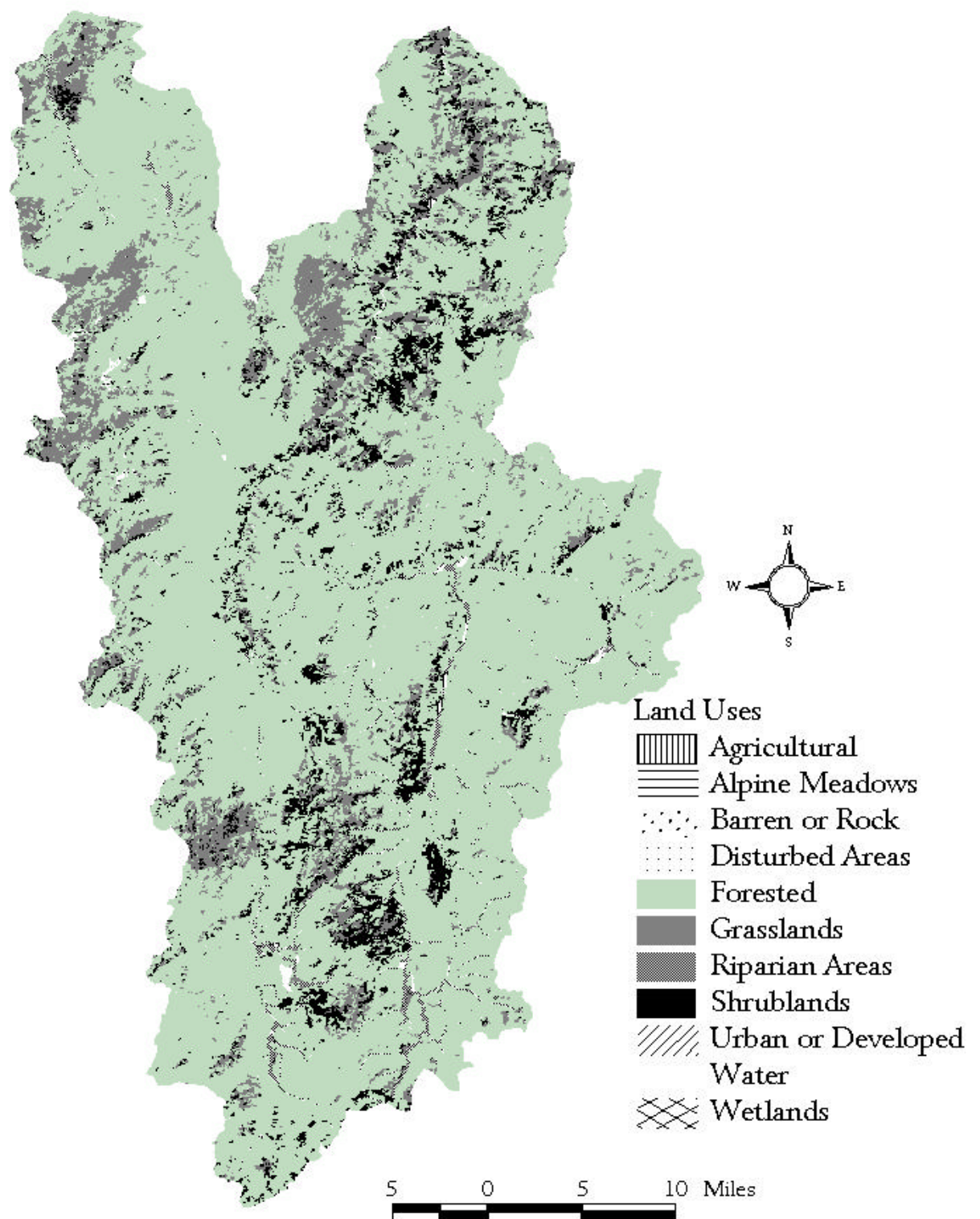


Figure 7. Land Use within the SF Salmon Subbasin

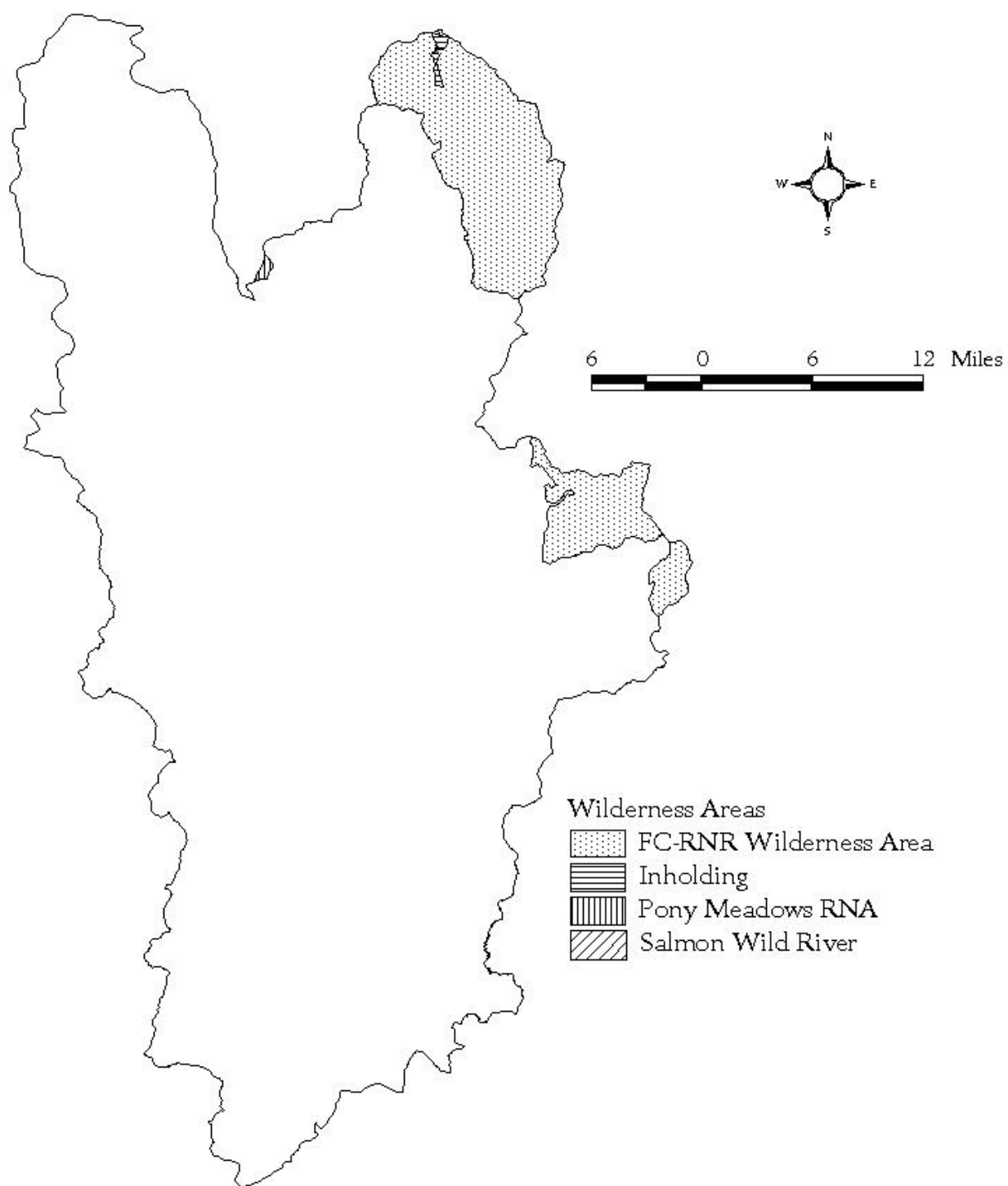


Figure 8. Wilderness Areas Located within the SF Salmon Subbasin

Table 5. Ownership in the SF Salmon River Watershed

Ownership	Acres	Percentage
Payette National Forest	544,038.2	64.8%
Boise National Forest	278,631.6	33.2%
State	8,736.4	1.0%
Private	6,116.1	0.7%
Lakes and Streams	976.5	0.1%
TOTAL ACRES	840,053.6	
Wilderness Area Acres*	69099	8.2%
Road Miles**	687.2	

* Wilderness area acres are already included in national forest totals.

** Road miles reflect only open roads and do not include non-system closed roads (USDA Forest Service, 2000).

Table 6. SF Salmon Timeline (USDA Forest Service, 2000)

Year	Event
1831	Trappers of the American Fur Company reach Long Valley
1855	First treaty signed with the Nez Perce
1862	Gold discovered at Warren, Idaho
1863	Idaho Territory created
1870	4,274 Chinese in Idaho Territory, 355 in Warren
1877	Nez Perce War
1878	Bannock War
1879	Sheepeater War
1889	5000 head of sheep grazed in Warm Lake Basin
1900	W. Stonebreaker and James Campbell build a road from Grangeville to Thunder Mountain--"The Three Blaze Trail"
1908	Idaho Forest Reserve created
1920	25000 sheep in Krassel Ranger District; 200,000-300,000 sheep in Johnson Creek
1920's	Road constructed from Johnson Creek to Stibnite, mining begins
1931	Idaho Primitive Area created
1933	First CCC camps established on the Weiser and Idaho Forests
1936	SF Salmon Road constructed to Krassel by CCCs
1940's-1950's	Stibnite/Yellow Pine supported a population of 1500
1944	Weiser and Idaho forests consolidated into the Payette National Forest
1950's	Sheep grazing numbers reduced
1960	Multiple Use- Sustained Yield Act directs the Forest Service to give equal consideration to outdoor recreation, range, timber, water, wildlife and fish
1970	Sheep grazing allotments closed
1977	Creation of Frank Church River of No Return Wilderness

One factor that influences the impacts a road may have on the volume of sediment delivered to water bodies is the “sediment/delivery” combination. Sections of roads that directly flow into water bodies are considered “connected” and tend to have a high potential for impact. For example, Reid (1981) found 73% of the road system in the Clearwater (Washington) drainage was connected. Wemple (1996) also found high connection rates. Surveys conducted by Luce (2000) in the coast range turned up a 32% connection rate consisting of about 90% connection along streams, 50% connection on mid-slope roads, and nearly no connection from roads on the very top of ridges. Some of the greatest sediment production/delivery combinations were from connected mid-slope roads because they tend to be steeper.

One of the key factors in assessing the impacts of sediment, from both anthropogenic and natural sources, within the SF Salmon Subbasin is that the sediment is mobilized during episodic storm events. How the morphology and aquatic habitat within these water bodies respond to the volume of flow and sediment delivered during these episodic events determines whether the beneficial uses are impacted. A summary of the episodic events within the SF Salmon Subbasin is present in the Stream Hydrology section below.

Mining

Mining has played a significant role in the human history of the SF Salmon Subbasin. The alluvial deposits in and along the SF and the EF SF Salmon Rivers, the Upper Secesh River and Johnson Creek were explored and mined for placer gold during the latter portion of the nineteenth century and into recent years. Most of the activity was limited in scale. The most extensive mining in the Subbasin occurred in the Upper EF SF of the Salmon River (EF SF Salmon). Antimony and tungsten were mined at Stibnite from the 1930s through the 1950s. During World War II, Stibnite produced 98 percent of the antimony and 60% of the tungsten for the allied war effort. Beginning in the 1970s and continuing until 1997, gold was produced from a moderately large surface mine at Stibnite using heap-leach techniques. Stibnite is located 19 miles east of Yellowpine. Stibnite is now closed and has been reclaimed through an administrative order of consent between Mobil Company, IDL, IDEQ, USEPA and the US Forest Service (Griner and Woodward-Cyde, 2000).

Mines at Cinnabar and Fern Creek produced significant quantities of mercury during the 1940s and 1950s. Discovered in 1902 during the Thunder Mountain Gold Rush, Cinnabar Mine is a 50-acre site located 21 miles east of Yellow Pine (i.e. four miles east of the Stibnite mine). The greatest amount of activity at Cinnabar Mine occurred during the forties and fifties.

The SF Salmon Subbasin is open to mineral activities and prospecting with certain exceptions. The SF Salmon River and its tributaries, including Johnson Creek and the Secesh River, are presently closed to recreational suction dredging due to concerns about fish habitat and water quality. The locatable mineral potential is high in the vicinity of Warren and Stibnite, and interest in exploration is high. Gold exploration on forest service and private lands is occurring in the Golden Gate area of Johnson Creek. Placer and lode claims exist in the Subbasin, although most of these are not actively mined at this time.

The lease-able mineral potential for geothermal resources in the upper SF Salmon River is high. Currently, there are no applications for geothermal leases in the area. The presence of other lease-able minerals such as oil and gas is low or nonexistent in the Subbasin. The demand for the common variety minerals such as gravel and landscaping rock is low. The Forest Service handles common mineral removal through a permit system. “ (USDA Forest Service, 2000).

Grazing

Currently, grazing plays a very minor role in the SF Salmon watershed and is associated with permitted outfitter and guide activity on National Forest System lands. Limited grazing occurs on private land near Yellow Pine. Grazing allotments are summarized in Table 7. All of these allotments are currently utilized except Sand Creek and North Fork Lick Creek. The use in these allotments has decreased over the last ten years (USDA Forest Service, 2000).

Table 7. Grazing Allotments in the SF Salmon Subbasin

Allotment	Animal Grazing Units
Hanson Creek	15 horses
Sand Creek S&G	Cattle and horse (AGU not specified)
Johnson Creek near Landmark	Unspecified
North Fork Lick creek	One band of 1500 head, cattle
Josephine S&G	One band of 1000 head, cattle
Bear Pete S&G	One band of 835 head, cattle
Marshall Mountain S&G	One band of 835 head, cattle
Victor Loon S&G	One band of 1000 head, cattle

Historically, the SF Salmon River and Johnson Creek drainages were affected by sheep grazing that occurred from the turn of the century through the early 1960's. The first 5,000 head of sheep were introduced in the Warm Lake Basin in 1889. By 1920, 25,000 sheep grazed in the Blackmare drainage and the Buckhorn drainage. The number of grazing allotments reduced over the years to 1,988 head in the 1950's. Once the Forest Service realized the erosion on the steep slopes and the sheep market collapsed in the 1960's the allotments were closed. By 1970 the Forest Service waived all grazing allotments in the SF Salmon Subbasin (USDA Forest Service, 1995).

In the 1920's, large numbers of sheep (i.e. 200,000 in Johnson Creek, twice the estimated carrying capacity estimated) affected vegetation and soil conditions by increasing compaction, reducing re-vegetation potential, increasing bare soil, reducing organic matter, and reducing plant root volume, depth, cover, density and vigor. Sheep are adapted to grazing steep slopes and prefer forbes although they consume green grass in the spring and woody species such as *Salix* spp. in the fall (USDA Forest Service, 1995).

After the 1920's, allotment stocking was designated to deal with overuse issues. Erosion and poor vegetation recovery resulted in a reduction of sheep numbers in the 1950's. In the

1960's the sheep market crashed and sheep grazing ended. The allotments were shifted from sheep to cattle in the 1960's (USDA Forest Service, 1995).

Cattle tend to utilize and congregate on level areas (i.e. valley bottoms, ridge tops) as well as on rolling hillsides. Cattle prefer grass but will consume browse and some broad-leaved forbes later in the season. Impacts from cattle grazing include erosion and soil compaction as well as vegetation removal. Most areas impacted by cattle and sheep were left to recover naturally.

Recreation

The SF Salmon Subbasin affords recreational opportunities such as hunting, fishing, berry and mushroom picking, sightseeing, camping, rafting, off road recreational vehicle use and hiking. Recreation rates have stayed stable, increasing slightly over the last 10 years (USDA Forest Service, 2000). In addition, there are resorts, lodges, summer homes in the Yellow Pine, Johnson Creek, Secesh, Warm Lake, Warren and Burgdorf areas. Eleven different outfitters operate in the Subbasin offering activities such as horse packing, fishing guides, and hunting (USDA Forest Service, 2000).

Upland and Riparian Vegetation

Historically the primary disturbance in the SF Salmon Subbasin has been fires. Frequent low intensity fires every 5 to 25 years helped to maintain the mature pine stands. Douglas-fir and grand-fir were the dominate cover in the mid to upper slopes prior to settlement. Subalpine fir and lodgepole pine dominated the higher elevations. Fire severity and frequency occurring any where from 60 to 500 years produced a mosaic of age classes and species composition (USDA Forest Service, 2000). Whitebark pine grows in the Subbasin along the ridge tops above 7000 feet. Tables 8 and 9 show the historic upland cover and existing vegetation cover in the basin, respectively.

Table 8. Historic Upland Cover (USDA Forest Service, 2000)

Cover	Percent of Area in Entire Subbasin*
Non Forested Cover	1%
Lodgepole Pine	26%
Whitebark Pine	7%
Whitebark Pine/Alpine Larch	1%
Interior Ponderosa Pine	18%
Interior Douglas-fir	20%
Englemann Spruce/Subalpine Fir	26%

*Percentages <1% were not included in this table.

Table 9. Existing vegetation cover (USDA Forest Service, 2000)

Cover	Percent of Area in Entire Subbasin*
Non Forested Cover	
Upland Grass	2%
Montane/Subalpine Grassland	3%
Mesic Shrub	4%
Sagebrush	1%
Rock/Barren	4%
Forested Cover	
Aspen	1%
Lodgepole Pine	21%
Whitebark Pine	1%
Ponderosa Pine	5%
Douglas-fir	4%
Douglas-fir/Lodgepole Pine	2%
Douglas-fir/Grand Fir	2%
Douglas-fir/Ponderosa Pine	11%
Mixed Whitebark Pine Forest	7%
Mixed Subalpine Forest	16%
Mixed Mesic Forest	5%
Mixed Xeric Forest	4%
Mixed Broadleaf/Conifer Forest	3%
Moderate Intensity Burn (1994)	1%
High Intensity Burn (1994)	3%

*Percentages <1% were not included in this table.

In the bottomland meadow areas of the watershed the vegetation is of key importance. Vegetation provides surface run off filtration, organic matter for water holding capacity and surface water infiltration (USDA Forest Service, 1995). The composition of the riparian area of a meadow is a good indicator of the land-type's current hydrologic storage, buffer and regulation capabilities.

Overall, riparian vegetation extends along river and streams throughout the Subbasin and consists of moist soil vegetation types (USDA Forest Service, 2000). A stable riparian area provides protection, filtration and buffer to the stream. Along with depositing Large Woody Debris (LWD) the riparian provides shade to help regulate stream temperature. Karen Kuzis notes that "conifer Stands provide more long-term LWD than deciduous stands and that a stand must be well-stocked (i.e. greater than 60% canopy closure) to provide adequate long term LWD inputs." Disturbance factors affecting the riparian of the watershed include timber harvest, fire, flooding, drought, and grazing.

Hydrology and Stream Morphology

The surface water hydrology of the SF Salmon River is typical of the northern Rocky Mountains in Idaho (Kuzis, 1997). The Integrated Scientific Assessment for the Interior

Columbia River Basin Ecosystem Management Project (ICBEMP) found the hydrologic integrity of the Subbasin to be high. This judgment was based on a process that incorporated descriptive data, empirical models, trend analysis and expert judgment (USDA Forest Service, 2000). Anthropogenic activities have not significantly altered surface and groundwater flows (Kuzis, 1997).

The SF Salmon River watershed contains four major tributaries: the Secesh River, the EF SF Salmon River, Johnson Creek and the upper SF. In addition to stream channels the SF Salmon River watershed contains 37 lakes. The largest is Warm Lake (640 acres). Other alpine lakes range in size from 1-160 acres (Kuzis, 1997).

Groundwater is present mainly in alluvium and to a limited extent in fractured bedrock. Water bearing zones are primarily recharged from direct infiltration of precipitation and snowmelt. Recharge also occurs from seepage from losing reaches of streams and springs. Discharge is from springs, seeps and as base flow from gaining reaches of area streams (Kuzis, 1997).

Peak stream discharge typically occurs during a six week period in May and June following snow melt. Rain-on-snow events contribute to peak discharges at lower elevations at other times of the year. Base flows occur from September to January. For the period of record, 1928 to 1995 at the mouth of Johnson Creek near Yellow Pine, mean annual discharge ranged from 123 cfs to 622 cfs, with a peak of 6,300 cfs in 1974 (USGS, 1996). Low flows for the SF Salmon at the mouth are between 800-1200 cfs while high flow ranges from 15-20,000 cfs. (USDA Forest Service, 2000). Table 10 lists the USGS stream gages in the subbasin. Shorter periods of record are also available for EF SF Salmon River at Stibnite, the Secesh River near Burgdorf, the SF Salmon River near Warren, Circle End Creek, Tailholt Creek, Zena Creek, Buckhorn Creek, Dollar Creek, Blackmare Creek, and others (Kuzis, 1997).

Table 10. USGS Gaging Stations within the Salmon River Basin

Active/ Discontinued	Station No.	Location	Years Of Record	Drainage Area (MI ²)
A	17000	Salmon River @ White Bird	1919-1995	13,550
A	14300	SF Salmon River @ Mouth	1993-1995	1,310
		Near Mackay Bar		
D	14000	SF Salmon River Near Warren	1931-1943	1,160
D	14500	Warren Creek Near Warren	1943-1950	37
D	13800	Tailholt Creek Near Yellow Pine	1959-1962	2.6
D	13500	Secesh River Near Burgdorf	1943-1952	104
A	13000	Johnson Creek @ Yellow Pine	1928-1995	213
D	12500	Johnson Creek Near Landmark Ranger Station	1943-1949	54.7
D	12000	EFSFSR Near Stibnite	1928-1941	42.5
A	11000	EFSFSR @ Stibnite	1928-1941 1982-1995	19.6

Active/ Discontinued	Station No.	Location	Years Of Record	Drainage Area (MI ²)
A	10700	SFSR Near Krassel Ranger Station	1966-1982 1985-1986 1989-1995	330
D	10670	West Fork Buckhorn Creek Near Krassel Ranger Station	1990-1994	22.6
D	10660	Little Buckhorn Creek Near Krassel Ranger Station	1990-1994	5.99
D	10570	SFSR @ Poverty Flat Near Cascade	1990-1992	221.5
D	10565	Blackmare Creek Near Poverty Flat Near Cascade	1990-1992	17.8
D	10520	Dollar Creek Near Warm Lake Near Cascade	1990-1994	16.5
D	10500	SFSR Near Knox	1929-1961	92

The lower and middle SF Salmon River is defined as the portion of the SF Salmon River downstream from the confluence of the EF Salmon, excluding the Secesh River. Elevation ranges from 3,650 feet at the EF SF Salmon River confluence to 2,166 feet at the Salmon River confluence. The lower and middle SF Salmon River mainly flows through V-shaped canyon sections that are broken by only a few short, open U-shaped valley areas. The wider areas along the SF Salmon River occur near the mouths of Sheep, Elk, Smith and Knob Creeks. The mainstem SF Salmon River is predominately a B3c stream type (Rosgen, 1994). Stream gradients range from less than 1% in some short sections near Knob Creek to about 5% in the Rooster Creek area. Tributaries entering the SF Salmon River tend to be high gradient (5-10 %) streams (Rosgen type A), with sections of steep gradient that form fish passage barriers. Larger tributaries include Sheep, Elk, Pony, Smith, Porphyry, and Rooster Creeks. These streams drain relatively large areas and have gradients steeper than the SF Salmon River (Kuzis, 1997).

The SF Salmon River mainstem was examined for changes in stream channel characteristics caused by the high magnitude flood event that occurred during the winter of 1996-97 (Johnson, 2000). This rain on snow event was estimated to produce a 20-year flood event for the SF Salmon mainstem. Changes in meso-scale hydraulic features, sediment distribution, and geomorphic channel dimensions were compared using three separate flights of multi-spectral airborne imagery (MSAI) (July 1992; November 1993; and October 1997).

It was found that the SF Salmon River is largely stable and resistant to changes caused by large magnitude flooding. Observed changes during the study tended to be localized. One common occurrence was the evidence of flooding coming into the SF Salmon through tributary creeks. It was common to see areas of washed out riparian vegetation and the deposit of boulders, debris, or fine sediments at the mouth of the tributary or immediately downstream within the mainstem. The Elk Creek, Deer Creek, and Brewer Creek tributaries were identified as significant sources of sediment during this event.

Proceeding downstream from those areas with large sediment deposits from tributary input, sediments are sorted according to particle sizes. Finer sediments will be transported further

downstream, thus changing the formation of sediments not only at the mouths of tributaries but any other formation downstream. As sediment is sorted and deposited, a change in gradient and a re-adjustment in channel hydraulics begins to take place. One typical channel hydraulic response is to widen and shallow, thus locally increasing the channel's sediment transport capacity. Study findings, however, indicate that the SF Salmon River has mostly maintained channel width between high-water marks from the headwaters near Stolle Meadows downstream to the confluence with the main Salmon River (Johnson, 2000).

Typically, high magnitude flood events tend to increase channel diversity and in turn will often increase the diversity of salmonid fisheries habitat available. With respect to the 20-year flood in 1997, it is suspected that it assisted the SF Salmon River in reaching a state of improving dynamic equilibrium (i.e. where the rate of change is largely stable and favorable to the health of fisheries habitat) (Johnson, 2000).

The Secesh River subwatershed encompasses approximately 170,000 acres. The Secesh River enters the main SF Salmon River about one mile downstream of the EFSF. Channel gradients range from less than one percent along Lake Creek and the upper Secesh Meadows to over ten percent in canyon sections. Summer discharge readings range from highs of several thousand cubic feet per second (cfs) in May and June to lows of about 100 cfs in September. The Secesh River originates at the confluence of Summit and Lake Creeks. Marshall Lake is the source for Lake Creek (USDA Forest Service, 1994).

The EF SF Salmon River watershed covers approximately 250,000 acres and enters the mainstem SF Salmon River near the confluence of the Secesh River. The EF SF Salmon River is confined in a deep V-shaped canyon for much of its length. Short stretches of low gradient channel, where the canyon widens for short distances, occur in patches downstream of Yellow Pine and upstream of Quartz Creek. In general, stream channels in the watershed have low LWD, bank stability and pool frequency based on Pacfish, Forest Plan, and Idaho Natural Conditions databases. The most significant natural processes affecting channels are mass wasting and erosion.

The upper EFSF has been affected by historic mining and displays subtle morphologic adaptations to those influences. With respect to sediment and LWD, the upper EFSF consists primarily of source and transport reaches. Despite impacts due to mining, the overall channel condition of the upper EFSF is good (Kuzis, 1997), although the upper stretch has a low number of pools and low number of large woody debris. Widened channels and excessive median and lateral bar formation are evidence of past sediment inputs. Historic pool filling from mining related inputs of sediment and the naturally unstable nature of the geologic units in the upper portion of Sugar and Tamarack Creeks in the area have contributed to this low pool number.

However, the stream channels have shown significant natural recovery (Kuzis, 1997). Certain channel modifications are worth noting due to their significance. These modifications include:

- Glory Hole – This is an old mining pit constructed mid-channel in 1955 that currently acts as a sediment trap. While the EF SF Salmon River flows through Glory Hole, the 4 acre site does not affect large flows due to its size, and only slightly affects low flows (Kuzis, 1997). Glory Hole supports a vigorous fish population and healthy benthic macroinvertebrate community. This feature also displays thermal stratification but re-suspension of sediments due to turnover is not expected. The bottom velocities necessary for turnover would not be high enough for re-suspension (Griner and Woodward-Cyde, 2000).
- Meadow Creek - as a result of the reclamation Meadow Creek was reconstructed on the south side of the tailings area (4,575 ft) and the old channel was lined to reduce seepage (Griner and Woodward-Cyde, 2000).
- EF SF Salmon River (between Johnson and Parks Creeks) – This is the most vulnerable section of the lower EF SF to changes in sediment supply and basin disturbance due to the relatively wide valley and low (0.75%) gradients present. These combine to form a section dominated by long riffles and shallow pools and there is deposition of sediment of all sizes. Overall, the channel is limited within this section and does not tend to form pools (Kuzis, 1997).
- Lower Sugar Creek – This creek drains into the Upper EF SF Salmon River, showing widened channels, excessive medial and lateral bar formation in response to past sediment inputs. In the 1940's approximately 1 million cubic yards of glacial overburden was removed from the EFSF channel and placed in both Sugar Creek and other parts of the EF SF Salmon River (Kuzis, 1997).
- West End Creek - A tributary to Sugar Creek, West End Creek displays fully embedded cobbles. While West End Creek has improved over time, as of 1997 it was still introducing fines to Sugar Creek (Kuzis, 1997).

Johnson Creek is the largest tributary of the EF SF Salmon River, covering approximately 136,320 acres. Johnson Creek is a fifth order stream. The main stream channel flows through an open valley with short steeper sections (Deadhorse Rapids). Discharge ranges from peak flows of 2,000 to 4,000 cfs to a winter low of 50 to 100 cfs (USDA Forest Service, 1994). Flow data is available from 1928 to present from the USGS gage. The Johnson Creek drainage has sustained heavy impacts from grazing, road construction/grading and fire. The most sensitive channel reaches are 6 miles and 25 miles upstream from Yellow Pine respectively (Nelson et al., 1996).

Tributary streams to the SF Salmon River, the Secesh River, the EF SF Salmon River, and Johnson Creek generally exhibit Rosgen Type A and B morphology. Type A are entrenched streams exhibiting low sinuosity and a low width/depth ratio. Type B streams are moderately entrenched, showing moderate width/depth ratio and moderate sinuosity (Kuzis, 1997).

The portion of the SF Salmon basin above the confluence of the EF SF Salmon River covers approximately 232,000 acres. Rosgen type C channels alternate between V-shaped canyon sections and open U-shaped valley reaches. Low gradient reaches occur at Stolle Meadows,

Dollar Creek, Poverty Flats, Darling Cabin, Oxbow, and Glory areas. Tributary streams generally have steeper gradients.

Episodic Storm Event Summary for the SF Salmon Subbasin

Between 1958 and 1965, a series of intense storms and rain-on-snow events created numerous landslides and slumps triggered by logging and associated road construction, inundating the river and some of its tributaries with heavy sediment loads (Platts, 1972). A survey conducted in 1965 estimated about 1.5 million cubic yards (about 7 times normal) of sediment was stored in the upper 59 miles of the SF Salmon River and its tributaries (Arnold and Lundeen, 1968). Changes in channel profile and channel cross sections have documented a decrease in the channel bed elevation and percentage of fines, indicating that channel conditions improved over time (Megahan et al., 1980).

The rain on snow events in the winter and spring of 1965 caused over 100 landslides the majority of which were related to roads. These landslides introduced approximately 135,000 cubic yards of sediment to the SF Salmon River (Jensen and Cole 1965). In June of 1965 the dam on Blowout Creek (renamed after event) failed and an 8 foot surge of flood water, sediment and debris went into Meadow Creek, a tributary to the EF SF Salmon River. There was damage in the EF SF Salmon River all the way downstream to Yellow Pine.

In 1974, floods in the EF SF Salmon River drainage carried heavy loads of sediment into the EFSF. Johnson Creek registered a 100 year recurring flow (6300 cfs). The steep slopes and shallow soils found in the watershed combine to cause relatively rapid runoff. Discharge measurements range from peak flows of several thousand cfs during peak snowmelt in late May or early June to about 300 cfs or less during September (USDA Forest Service, 1994). Gaged records are available from the EFSF at Stibnite (Kuzis, 1997).

Management activities that remove forest cover (i.e. road construction, timber harvest, mining) have the potential to increase peak flows and water yield by reducing interception and evapotranspiration, with changes generally proportional to the canopy removed. Natural activities such as fire that affect forest cover also can change peak flows and water yield.

Areas impacted by these human activities include: Zena Creek, mainstem SF Salmon River upstream of Buckhorn Creek, Upper Johnson Creek, EFSF and tributaries around Stibnite and the area near Lake Creek in the Upper Secesh watershed. The 1950's and 1960's were the busiest in terms of timber harvest and road construction (USDA Forest Service, 1995). Mining activities were most intense in the 1940's and grazing impacts were greatest in the 1920's.

Fisheries

The SF Salmon River system maintains nineteen fish species; three anadromous, ten native residents and six introduced. This Subbasin plays a key role for chinook salmon, steelhead, bull trout and westslope cutthroat trout, which are all Threatened, Endangered or Sensitive

(TES) species. Table 11 outlines the fish species present and the status of populations in the SF Salmon River basin.

Table 11. Fish Presence and Status in the SF Salmon Subbasin

Anadromous Species	Distribution	Status
Spring Chinook salmon	Headwater areas	Depressed, ESA threatened
Summer Chinook salmon	Throughout watershed in mainstem and low-gradient tributary areas	Depressed, ESA threatened
Fall Chinook salmon (Ocean type)	Historically in lower portion of drainage	ESA threatened, (believed extirpated)
Sockeye Salmon	Historical runs into Loon and Warm Lake	Maybe occasional sighting
Steel head	Throughout watershed	Depressed, ESA threatened
Pacific lamprey	Uncommon	Depressed, IDFG state endangered species
Native Resident Species		
Redband trout	Throughout watershed	Common, USFWS species of special concern
Bull trout	Locally common in parts of watershed but overall depressed throughout range	Depressed, ESA threatened
Westslope cutthroat trout	Throughout watershed	Depressed, petitioned for ESA threatened, USFS R4 sensitive
Kokanee	Warm Lake and Loon Lake	Present
Mountain Whitefish	Mainstem river and larger tributaries	Present
Northern Pikeminnow	Lower SFSR below Secesh River, common in lower six miles	Locally common
Redside shiner	Uncommon in lower part of SFSR	Present
Suckers	Common	Present
Longnose dace	Throughout watershed	Present
Speckled dace	Unknown	Present
Sculpin	Spotty observation record	Present
Introduced Resident Species		
Cutthroat trout	High mountain lakes – mixed stock	Present
Rainbow trout	Throughout watershed	Present
Cutthroat x Rainbow	High mountain lake	Present

Anadromous Species	Distribution	Status
Brook trout	Common in some areas	Locally common
Lake trout	Warm Lake, 33 Lake	Limited
Golden trout	High mountain lakes	Limited
Arctic grayling	High mountain lakes	Limited

Historically, the SFSR was the single-most important summer chinook spawning stream in the Columbia River basin (Mallet, 1974). Chinook salmon are found distributed throughout the SF Salmon Basin with the highest numbers found in the Secesh River and mainstem of the SF Salmon River. All perennial streams in the watershed are designated as salmon critical habitat (USDA Forest Service, 2000).

Karen Kuzis' technical report (1997) on fish in the SF Salmon River notes the trend is decreasing numbers. The best long-term information on escapement are the annual fish counts over the uppermost dam on the Snake River (Apperson, 2000). Returns of steelhead and chinook past the uppermost dam have decreased from highs greater than 50,000 fish/year in the 1960's to less than 10,000 fish/year over the last three years. Although there are areas of degradation in each of the major tributaries each tributary supports suitable anadromous spawning and rearing habitat which is in good condition (USDA Forest Service, 1988; USDA Forest Service, 1995). Tables 12 through 15 outline the habitat requirements for Summer Chinook, Steelhead, Bull Trout and Cutthroat Trout, respectively.

Recent research indicates that the regional decreases in anadromous fish are in response to migration corridor modification due to hydroelectric development on the Columbia and Snake Rivers, over fishing of ocean stocks and habitat degradation (Lee et al, in review). A significant discrepancy between historical and current populations is exhibited throughout the system (USDA Forest Service, 2001). Therefore, all anadromous fish (chinook and steelhead remain at risk.

Table 12. Summer Chinook Habitat Requirements (Kuzis, 1997)

Activity	Conditions	Timing
Spawning	5.6-13.9 ° C, .6 - 10.2 cm gravel, redd size 5.1m ²	Late August & September
Incubation	5.0-14.4 ° C, survival drops off with > 30% fines (<6.35mm)	Late Aug. to May
Winter Habitat	Pools, interstitial spaces in cobble/ gravel substrate. Lower SF and main Salmon	Dec. - May (temps. <4 C)
Summer Habitat	grassy banks and deep pools; not found in channels over 10 % gradient, with 2 to 4 % optimum	May - Dec.

Steelhead, another of the aquatic uses listed under the Endangered Species Act, is present within the SF Salmon River basin. Only two other basins in Idaho besides the SF Salmon currently supports wild native steelhead (USDA Forest Service, 2000). The National Marine Fisheries Service (NMFS) has designated the SF Salmon River as critical habitat for Snake

River steelhead. The critical habitat is defined as all river reaches accessible to fish, and consists of the water, substrate, and riparian zone of the reaches. Accessible reaches are those that can still be occupied by any life stage of steelhead.

Table 13. Steelhead Habitat Requirements (Kuzis, 1997)

Activity	Conditions	Timing
Spawning	3.9 to 9.4 ° C; 0.6 - 10.2cm gravel, redd sizes 4.4-5.4m ²	April - early June
Incubation	No redd scouring or siltation, survival drops off with > 25% fines (<6.35mm)	spring - midsummer
Winter habitat	Pools, interstitial spaces in cobble/ gravel substrate. Lower SFSR, main Salmon	water temps. <4 °C
Summer habitat	Age I pocket water and runs, age II pocket water, and age III utilized all three habitats; water temps. 10 -13° C, (lethal temps. 23.9° C)	May-Dec.

Bull trout, another ESA listed species, are distributed throughout the watershed. The historic population status is unknown but distribution is considered to be similar to historic. The SF Salmon supports both resident and migratory bull trout populations. Tributaries act as spawning and rearing areas for fluvial bull trout. Juveniles usually live in the tributaries for one to three years before migrating to mainstems in the spring and summer high flows (USDA Forest Service, 2000). Bull trout populations in Idaho are considered depressed due to over harvest and habitat modifications, which has limited the fluvial migratory component of their life history. Hybridization and competition with non-native species such as brook trout have also contributed to the depression of the species.

Table 14. Bull Trout Habitat Requirements (Kuzis, 1997)

Activity	Conditions	Timing
Spawning	loose gravels and cobble	Sept. - Oct.
Incubation	success increases with temperatures <10°C, optimum 2 to 4°C, stable substrate	September - June
Winter habitat	Pools, interstitial spaces in cobble/ gravel substrate. Lower SFSR, main Salmon	Water temperatures < 5°C
Summer habitat	temps 9 - 15° C, food and escape cover; Stream gradients of 6 to 9 %	Water temperatures > 5°C

The distribution of cutthroat trout is considered to be wide and similar to historic distributions. Resident abundance has greatly decreased in the last 50 years due to angler harvest, declines in the number of fluvial fish, destruction of spawning and rearing habitat and introduced species that displace the cutthroat. Spawning occurs when water temperatures are optimal, young fish will stay in the tributaries for two to three years before migrating downstream in response to food or habitat needs (USDA Forest Service, 2000).

Table 15. Cutthroat Trout Habitat Requirements (Kuzis, 1997)

Activity	Conditions	Timing
Spawning	6.1 to 17.2 ° C; 0.07-3.5 cm gravel, redd sizes .09-.9 m ²	March - June
Incubation	Stable substrate, no sedimentation, usually 50 - 100 days, survival drops off with > 10% fines (<6.35mm)	temperature dependent
Winter habitat	Pools, interstitial spaces in cobble/ gravel substrate. Lower SFSR, main Salmon	Water temperatures < 5°C
Summer habitat	Pools and lateral habitats, water temperatures 10 -19° C, food and escape cover (lethal temps. 22.8° C); gradients .5 to 3.8 %	Water temperatures > 5°C

Many of the past studies in the Subbasin did not record whitefish numbers. Studies in which whitefish were counted found low densities near the mouth of Sugar Creek and Tamarack Creek. Whitefish occur in the main EF SF Salmon River to the reach just above the Glory Hole. They were not observed in the 1994 IDFG snorkel surveys in Profile Creek. Their distribution in other tributaries is uncertain because the presence of whitefish has not been consistently recorded (Kuzis 1997).

2. Subbasin Assessment – Water Quality Concerns and Status

2.1 Water Quality Limited Segments Occurring in the Subbasin

As shown in Table 16, there are eight 303(d) listed water bodies in the SF Salmon River subbasin. These water bodies include the SF Salmon River, the EFSF Salmon River, Johnson Creek, Rice Creek, Dollar Creek, Trail Creek, Trout Creek, and Tyndall Creek (i.e. upper Johnson Creek). The pollutant of concern is sediment for all of the listed waterbodies and metals for the East Fork of the SF Salmon.

Table 16. 303(d) Water Bodies in the SF Salmon River Subbasin

Water Body Name	Segment ID Number	303(d) ¹ Boundaries	Pollutants
SF Salmon River	2915-20	Headwaters to Salmon River	Sediment
EFSF Salmon River	2934-36	Headwaters to Salmon River	Sediment, Metals
Johnson Creek	2940-42	Headwaters to S Fk Salmon River	Sediment
Rice Creek	2959	Headwaters to S Fk Salmon River	Sediment
Dollar Creek	5066	Headwaters to S Fk Salmon River	Sediment
Trail Creek	5195	Headwaters to Curtis Creek	Sediment
Trout Creek	5199	Headwaters to Johnson Creek	Sediment
Tyndall Creek	5203	Headwaters to Johnson Creek	Sediment

¹Refers to a list created in 1998 of water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303 subsection “d” of the Clean Water Act.

The Federal Clean Water Act (CWA) requires restoration and maintenance of the chemical, physical, and biological integrity of the nation’s waters (Public Law 92-500 Federal Water Pollution Control Act Amendments of 1972). Each state is required to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the water whenever attainable.

Section 303(d) of the CWA establishes requirements for states to identify and prioritize water bodies that do not meet state water quality standards despite the application of technology based controls on point sources. States must publish a list (a.k.a. 303(d) list) of these waters, including priority ranking of such waters, every two years. The USEPA provides review and approval of the 303(d) list.

Either the USEPA or the state must develop Total Maximum Daily Loads (TMDLs) to achieve water quality standards for waters identified as impaired due to one or more

pollutants on the 303(d) list. A TMDL documents the current load, the load capacity (i.e., the amount of a pollutant a water body can assimilate without violating a state's water quality standards), and allocates the load capacity to known point and non-point sources. If none of the existing data show that the water quality standards are violated due to a pollutant load, the USEPA and the state uses this information to update the current 303(d) list. In this case the USEPA and the state is not required to proceed with Steps 2 (the TMDL) or 3 (the implementation plan).

TMDLs are defined in 40 CFR Part 130 as the sum of the individual Waste Load Allocations (WLA) for point sources and Load Allocations (LA) for non-point sources, including a margin of safety and natural background conditions. Regulations implementing 303(d) are found at 40 CFR Part 130. Total maximum daily loads are defined in Part 130.2 as:

The sum of the individual WLAs for point sources and LAs for non-point sources and natural background. If a receiving water has only one point source discharger, the TMDL is the sum of that point source WLA plus the LAs for any non-point sources of pollution and natural background sources, tributaries, or adjacent segments. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure...

In essence, TMDLs and TMDL Implementation Plans are water quality management plans that allocate responsibility for pollution reduction with a goal of achieving water quality standards within a specified period of time.

It is the State's responsibility to develop their respective 303(d) list and establish a TMDL for the parameter(s) causing water body impairment (i.e. a violation of State water quality standards and failure to support beneficial uses).

In response to these responsibilities Idaho adopted Idaho Code sections 39-3601 through 39-3616, which establish state water quality law. In summary, these laws require:

- monitoring of all streams to establish designated uses and determine whether water bodies comply with state water quality standards;
- developing TMDLs for waters which do not comply with water quality standards or beneficial uses are not supported due to a pollutant; and
- establishing citizen advisory groups [Basin Advisory Groups (BAGs) and Watershed Advisory Groups (WAGs)], to advise DEQ on prioritizing impaired water bodies, how to properly manage impaired watersheds, and recommend pollution control activities in impaired watersheds.

Subsequent to adoption of Idaho Code 39-3601, et. seq., IDEQ adopted implementing regulations. Public participation requirements for BAGs and DEQ are outlined in the Idaho Administrative Procedures Act (IDAPA) 58.01.02.052. IDAPA 58.01.02.053 establishes a procedure to determine whether a water body fully supports designated and existing beneficial uses, relying heavily upon aquatic habitat and biological parameters, as outlined in the Water Body Assessment Guidance (IDEQ, 1996). IDAPA 58.01.02.054 outlines

procedures for identifying water quality-limited (WQL) waters that require TMDL development, publishing lists of WQL water bodies, prioritizing water bodies for TMDL development, and establishing management restrictions, which apply to WQL water bodies until TMDLs are developed.

The 1991 SF Salmon Sediment TMDL

The eight-year schedule adopted by the State of Idaho established that the support status of listed water bodies within the SF Salmon fourth field hydrologic unit would be assessed by the end of 2000. Within this timeframe, the State of Idaho is also to re-visit, and possibly revise, the 1991 sediment TMDL approved by the USEPA.

This earlier TMDL was developed by a consensus team with members from the USDA Forest Service, the USEPA, and state representatives. The 1991 TMDL is located in Appendix B. Based on results of the USDA Forest Service surface erosion model, BOISED, fisheries trend data, and professional experience, the team developed the following sediment targets for the SF Salmon River:

- 1) A 5-year mean of 27 percent depth fines by weight with no single year over 29 percent;
- 2) A 5-year mean of 32 percent cobble embeddedness, with no single year over 37 percent;
or
- 3) Acceptable improving trends in monitored water quality parameters that “re-establish” the beneficial uses of the SF Salmon River.

The team based their findings that the water body violated state standards under the narrative sediment standard only. During the development of the sediment targets, it was admitted that there was great uncertainty that the numeric targets selected would actually restore salmonid spawning in the river (i.e. to historic levels). Therefore, stated objectives were to provide habitat “sufficient to support fishable populations of naturally spawning and rearing salmon and trout”. Ultimate achievement of water quality standards under this framework was based on data that indicated that naturally producing populations of chinook and steelhead “tolerant of sustained recreational harvest” were present.

2.2 Applicable Water Quality Standards

Idaho water quality standards include criteria necessary to protect designated and existing beneficial uses. The standards are divided into three sections: General Surface Water Criteria, Surface Water Quality Criteria for Use Classifications, and Site-Specific Surface Water Quality Criteria (Figure 9) (IDEQ, 2000). All Idaho water quality criteria for surface waters are applicable within the SF Salmon Subbasin.

Surface water beneficial use classifications are intended to protect the various uses of the state’s surface water. Designated beneficial uses are listed in Idaho’s Water Quality Standards and Wastewater Treatment Requirements (IDEQ, 2000; IDAPA 58.01.02). They are comprised of five categories: aquatic life, recreation, water supply, wildlife habitat, and aesthetics.

Aquatic life classifications are for water bodies that are suitable or intended to be made suitable for protection and maintenance of viable communities of aquatic organism and populations of significant aquatic species. Aquatic life uses include cold water, salmonid spawning, seasonal cold water, warm water, and modified.

Recreation classifications are for water bodies that are suitable or intended to be made suitable for primary contact recreation and secondary contact recreation. Primary contact recreation, like swimming, entails prolonged and intimate contact by humans where ingestion of raw water is likely to occur. Secondary contact recreation, such as fishing or boating, entails recreational uses where ingestion is unlikely.

Water supply classifications are for water bodies that are suitable or intended to be made suitable for agriculture, domestic, and industrial uses. Wildlife habitat waters are those which are suitable or intended to be made suitable for wildlife habitat. Aesthetic criteria apply to all waters.

Table 2 in Section 1 of this assessment shows the beneficial uses for the 303(d) listed water bodies and other water bodies in the SF Salmon River basin.

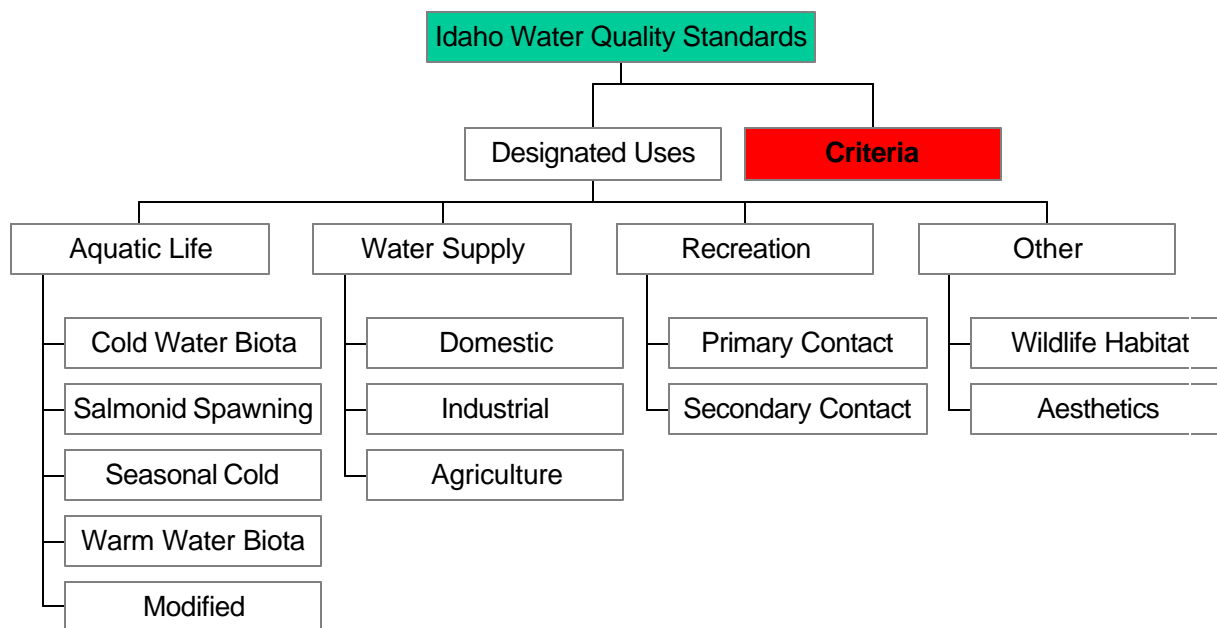


Figure 9. Idaho Water Quality Standard Framework

Water Quality Criteria – General

The general surface water criteria are usually referred to as the narrative criteria. These apply to all waters of the state in addition to other criteria that may apply. Generally, these narrative criteria state that waters shall be free from materials or matter in concentrations that impair beneficial uses. Sediment is among these materials. Numerous water bodies located within the SF Salmon fourth-field HUC are listed on the 1998 State of Idaho 303(d) list for

impairment as a result of sediment. The general surface water criteria for sediment (IDAPA 58.01.02.200.08) from Idaho Water Quality Standards and Wastewater Treatment Requirements (IDEQ, 2000) is as follows:

Sediment shall not exceed quantities specified in Section 250, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350.02.b.

Numeric Water Quality Criteria for Surface Water Designated Uses

These criteria include specific concentrations for individual pollutants that are based on categories and individual beneficial uses. IDAPA 58.01.02.070 specifies how the water quality standards are to be applied to Idaho's water bodies. A "natural background conditions" clause is included in this section and states that: "Where natural background conditions from natural surface or ground water sources exceed any applicable water quality criteria...that background level shall become the applicable site-specific water quality criteria."

Recreation

Primary contact recreation criteria apply to waters where prolonged and intimate contact by humans when the ingestion of water is likely to occur. Secondary contact recreation criteria apply to waters other than those designated for primary contact recreation. The major constituent of concern under Idaho state water quality standards is *E. coli*. Water bodies for which primary contact recreation uses are supported must have amounts of *E. coli* that do not exceed: (1) 406 organisms per 100 ml (17/oz) at any time, or; (2) a geometric mean of 126 organisms per 100 ml (7/oz) based on a minimum of 5 samples taken over a 30 day period. All other water bodies (i.e. secondary contact recreation) should have amounts of *E. coli* that do not exceed: (1) 576 organisms per 100 ml (27/oz) at any time, or; (2) a geometric mean of 126 organisms per 100 ml (7/oz) based on a minimum of 5 samples taken over a 30 day period.

IDAPA 58.01.02.080.03 specifies that a single water quality sample exceeding an *E. coli* standard does not in itself constitute a violation of water quality standards. This section then specifies how additional samples are required for the purpose of comparing the results of the one time sample to the geometric mean criteria.

Aquatic Life

All streams with aquatic life use classifications (cold water biota, warm water biota, salmonid spawning) should have concentrations of:

- pH between 6.5 and 9.5;
- dissolved gas not exceeding 110%;
- total chlorine residual of less than 19 g/L/hr or and average of 11 g/L/4 day period;
- less than toxic substances criteria set forth in 40 CFR 131.36(b)(1) Columns B1, B2, D2.

Cold water biota are the life forms that inhabit cold water. These life forms include: game and non-game fish; aquatic macroinvertebrate; and aquatic periphyton. All streams with cold water biota use classifications should have concentrations of:

- Dissolved oxygen concentrations exceeding 6.0 mg/L;
- Temperatures less than 22 C (72°F)(instantaneous), and 19 C (66°F)(daily average);
- Low ammonia (formula/tables for exact concentration); or
- Turbidity less than 50 nephelometric turbidity units (instantaneous) or 25 nephelometric turbidity units (10 day average) greater than background.

Salmonids are all those fish that are classified in the family Salmonidae. The family Salmonidae contains the whitefish, salmon, trout, chars and graylings. Salmonids are characterized by the presence of an adipose fin and a pelvic appendage. Spawning criteria apply during site specific time periods. The time periods used for water bodies within the SF Salmon fourth field HUC are based on the spawning and egg incubation period by each species of salmonid. The time periods applied within the SF Salmon HUC (Table 17) have been solicited by the DEQ from sister agencies and land management agencies.

Salmonid spawning numeric criteria apply to streams in the SF Salmon Subbasin with existing and designated salmonid spawning and rearing populations. According to the Idaho water quality standards, all streams with salmonid spawning use classifications, and in streams where spawning occurs, should not exceed the following:

- Intergravel dissolved oxygen of 5.0 mg/L (instant) or 6.0 mg/L (7-day average);
- Dissolved oxygen of 6.0 mg/L (same as cold water biota); or
- Low ammonia (same as cold water biota).

Numeric temperature criteria are specified in Table 17.

Table 17. Salmonid Spawning Periods within the SF Salmon HUC

Species	General Timing	Specific Timing		Temperature Criteria (°C)		
		From	To	Daily Maximum	Daily Average	Seven Day Daily Maximum Average
Summer Chinook	Late August and September	8/10	9/30	13	9	NA
Steelhead	April to early June	4/1	6/10	13	9	NA
Westslope Cutthroat	March to June	3/1	6/30	13	9	NA
Bull Trout*	September and October	9/1	10/31	NA	9	12
Bull Trout**	June to September	6/1	9/30			10

*Applies to 4th-order streams located above fourteen hundred meters elevation.

**Federal standard

IDAPA 58.01.02.080.04 specifies that exceeding the temperature criteria will not constitute a violation of water quality standards when the air temperature exceeds the ninetieth percentile of the 7 day average daily maximum air temperature calculated in yearly series over the historic record measured at the nearest weather station. This exemption does not apply to the federal temperature standard for Bull trout.

Water Supply and Other Uses

Water supply use classifications include domestic drinking water, wildlife habitats, and aesthetics. The last two beneficial uses should generally be supported when more sensitive beneficial uses criteria (e.g., cold water biota) and general water quality criteria are met.

The IDEQ is the primary agency responsible for the protection of public drinking water in the State of Idaho. Idaho Rules for Public Drinking Water Systems include criteria necessary to protect all domestic water supplies. Requirements have been set forth for Treatment Techniques (IDAPA 10.01.08.500), Design Standards (IDAPA 10.01.08.550), and Operating Criteria for Public Drinking Water Systems (IDAPA 10.01.08.552).

Drinking water systems are classified according to whether they are public systems and the number of people usually served. As of 2001, there is one public water supply system within the SF Salmon Subbasin. The town of Yellowpine draws water from nearby Boulder Creek. No non-community (transient or non-transient) water systems within the sub-basin have been identified. If domestic uses occur then all surface sources of drinking water for public water systems must maintain filtration and disinfecting systems intended to maintain safe drinking water (IDAPA 58.01.08.550.05).

Numeric Criteria for Toxic Substances

IDAPA 58.01.02.210 incorporates the National Toxins Rule (40 CFR 131.36 (b)(1)). The incorporation of this rule identifies the following as the numeric criteria for all water bodies within the State of Idaho (Table 18).

Table 18. Water Quality Criteria for Metals and Cyanide (µg/L)

Toxic	Acute Criteria		Chronic Criteria	
	Idaho	USEPA	Idaho	USEPA
Analytes	--		Idaho	USEPA
Aluminum (total)	--	750	--	87
Antimony (total)	--	88	--	30
Arsenic(dissolved)	360	340	190	150
Cadmium(dissolved)	1.7	2	0.7	1.3
Chromium III	310	320	100	40
(dissolved)				
Chromium IV	15	15	11	11
(dissolved)				
Copper (dissolved)	8.9	7	6.3	4.8
Iron (total)	--	--	--	1000
Lead (dissolved)	30	30	1.2	0.9
Magnesium	--	--	--	--

Toxic	Acute Criteria		Chronic Criteria	
Manganese	--	--	--	--
Mercury (dissolved for acute, total for chronic)	2.1	1.2	0.012	.77
Nickel (dissolved)	790	260	87	29
Selenium (total)	20	--	5	5
Silver (dissolved)	1	1	--	--
Zinc (dissolved)	64	65	58	66
Cyanide WAD	22	--	5.2	--
Cyanide Free	--	22	--	5.2

*Note: some of these standards are dependent upon hardness or pH. See original rule for clarifications.

2.3 Summary and Analysis of Existing Water Quality Data

None of the water bodies listed on the 1998 303(d) had a full water body assessment completed prior to the submittal of the 1998 303(d) list. Therefore, this SBA is the first time the support status and attainment of water quality standards has been comprehensively reviewed. Figure 10 shows a map of these waters. Results of the water body assessments contained within this document are to be used by the Department of Environmental Quality and the USEPA to update the 303(d) list for the State of Idaho.

Biological Indications of Water Body Support Status

The Idaho Administrative Procedures Act (IDAPA 58.01.02.053) specifies that, when determining whether a water body fully supports designated and existing beneficial uses, the IDEQ is to determine whether all of the applicable water quality standards are being achieved and whether a healthy, balanced biological community is present. It also specifies that the IDEQ is to utilize the Water Body Assessment Guidance, plus other available data from cooperating agencies (e.g. "WBAG+") (IDEQ, 1996) to assist in the assessment of beneficial use status. Current guidance from the IDEQ indicates that the initial screen used to determine whether a water body is in violation of current water quality standards is primarily based on available monitoring data for the numeric water quality standards and the biologic life indicators present within the water body.

Macroinvertebrates – Cold Water Biota

The Water Body Assessment Guidance (WBAG) was developed to provide a non-arbitrary water body assessment method using data collected by the Beneficial Use Reconnaissance Protocol (BURP) and other sources. It is designed as an analytical tool for determining if a water body is supporting or not supporting a beneficial use. It is used to prioritize water bodies for more stringent assessments and to recommend candidate beneficial uses. Under the BURP protocol, numeric water quality standards, biological indicators (i.e. macroinvertebrates and fish presence and absence) and habitat characteristics are evaluated.

The threshold values used for the macroinvertebrate index (MBI) indicate that anything above 3.5 receives a “full” support status call. Threshold values for habitat index (HI) have been identified for each ecological region of Idaho. The SF Salmon HUC, located in the Northern Rockies region, has a threshold value of 64 for an “impaired”, 65-99 for a “needs verification”, and 100 or greater for a “not impaired” support status. Table 19 shows each of the MBI and HI scores for water bodies located within the SF Salmon HUC.

As can be seen, most of the MBI scores are greater than 3.5, with the one exception being Upper Trout Creek. Also, all of the HI scores fall into either the “needs verification” or “not impaired” value range. When the HI scores fall within the “needs verification” range, current guidance indicates that the biological indicators (i.e. MBI and data regarding fish spawning and rearing) are to be used in making a final determination on the water body’s support status.

Upper Trout Creek, along with a few other water bodies, were sampled during the summer of 2000 to verify that the low score was due to instream conditions and not sampling error. The results of this effort are presented in Table 20.

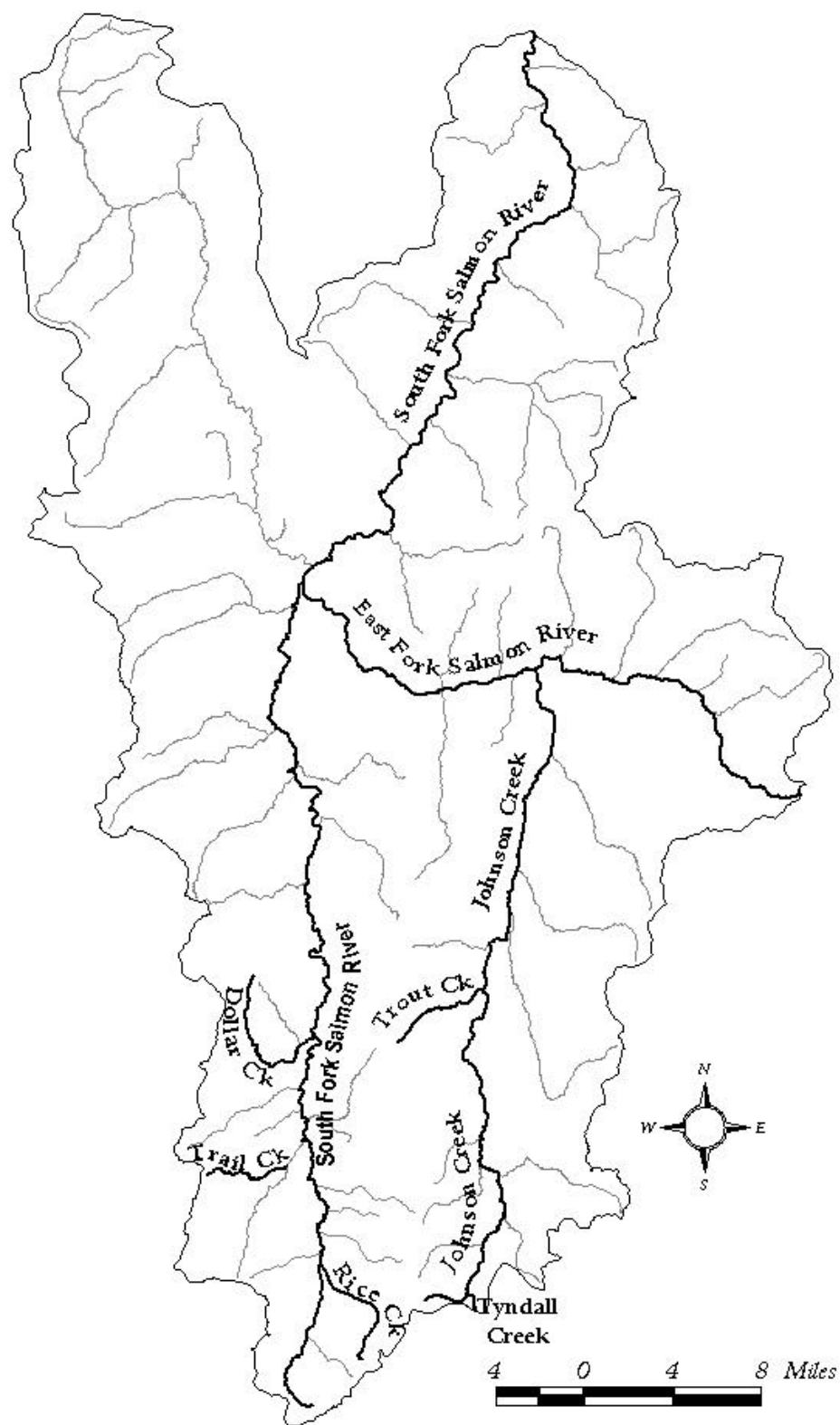


Figure 10. 1998 303(d) Listed Waters in the SF Salmon HUC

Table 19. Beneficial Use Reconnaissance Project Data (1993-1999)

BURP ID	Water Body	Water-body ID	Date	CWB¹	MBI²	HI³
93SWIRO07	Burntlog Creek	26	93-08-19	2	4.89	M
93SWIRO17	Riodan Creek	28	93-08-13	4	4.39	M
94SWIROA46	WF Buckhorn	12	94-07-22	3	5.06	94
94SWIROA47	Buckhorn Cr	12	94-07-22	5	3.96	91
94SWIROA58	Six Bit (U)	16	94-08-16	14	5.64	122
94SWIROA59	Six Bit (L)	16	94-08-16	13	5.69	119
94SWIROA60	Curtis (L)	17	94-08-16	11	4.53	101
94SWIROA61	Curtis (U)	17	94-08-17	12	5.2	98
95SWIROC12	Secesh River (L)	5	95-08-03	2	4.62	89
95SWIROC13	Secesh River (U)	5	95-08-03	2	3.64	84
95SWIROC24	Six Bit (L)	16	95-08-11	9	4.95	105
95SWIROC25	Curtis (L)	17	95-08-14	M	M	91
95SWIROC32	Six Bit	16	95-08-14	9	5.24	109
96SWIROB79	Summit Creek (L)	7	96-08-19	4	4.81	103
96SWIROB80	Summit Creek (U)	7	96-08-19	6	4.61	115
97SWIROA20	Dollar Creek (L)	15	97-07-07	3	3.81	111
97SWIROA21	Trout Creek (U)	25	97-07-08	4	2.01	90
97SWIROA22	Trout Creek (L)	25	97-07-08	7	4.68	91
97SWIROA23	Dollar Creek (U)	15	97-07-08	10	5.18	82
97SWIROA24	Bear Creek (U)	4	97-07-09	13	5.48	95
97SWIROA25	Bear Creek (L)	4	97-07-09	4	4.88	98
97SWIROA38	Ellison Creek	31	97-07-21	10	5.25	90
97SWIROA39	Missouri Creek (U)	31	97-07-22	8	4.28	90
97SWIROA40	Missouri Creek (L)	31	97-07-22	8	4.47	90
97SWIROA41	Profile Creek (L)	31	97-07-22	6	4.8	92
97SWIROA42	Boulder Creek	25	97-07-23	11	5.17	74
97SWIROA43	Salt Creek	23	97-07-23	10	4.16	91
97SWIROB42	Ryan Creek	31	97-07-21	10	4.96	96
97SWIROB43	Camp Creek	22	97-07-22	10	5.13	91
97SWIROB44	Profile Creek (U)	31	97-07-22	10	5.16	82
97SWIROB45	Tamarack Creek	30	97-07-23	7	5.01	100
97SWIROB46	Spring Creek	31	97-07-23	6	4.75	97
97SWIROB47	Vibitka Creek	23	97-07-24	9	4.84	98
97SWIROB48	Double A Creek	23	97-07-24	9	4.47	79
97SWIROB49	Johnson Creek (M)	25	97-07-28	0	4.88	74
97SWIROB50	Johnson Creek (U)	25	97-07-28	5	4.13	97
97SWIROB51	Sand Creek (U)	25	97-07-29	4	4.58	104
97SWIROB52	Sand Creek (L)	25	97-07-29	2	4.38	86
97SWIROB53	Johnson Creek (L)	25	97-07-29	4	4.64	91

BURP ID	Water Body	Water-body ID	Date	CWB ¹	MBI ²	HI ³
97SWIROB54	Lunch Creek (L)	25	97-07-29	6	4.78	117
97SWIROB55	Lunch Creek (U)	25	97-07-30	12	4.33	94
97SWIROB56	Lodgepole Ck (L)	10	97-07-30	12	5.31	98
97SWIROB57	Lodgepole Ck (U)	10	97-07-30	5	4.67	96
98SBOIA63	Rice Creek (U)	18	98-08-03	14	5.24	104
98SBOIA64	Rice Creek (L)	18	98-08-03	9	5.22	110
98SBOIA65	Tyndall Ck	25	98-08-04	13	5.47	100
98SBOIA66	Trail Creek (U)	17	98-08-04	13	5.38	104
98SBOIA67	Trail Creek (L)	17	98-08-05	7	5.23	115
98SBOIA68	Johnson Creek (U)	25	98-08-05	3	4.89	107
98SBOIA69	Johnson Creek (L)	25	98-08-06	M	M	112
98SWIROQ12	Warm Lake	20	98-07-27	M	M	M
99SBOIA020	Warm Lake Cr	20	99-08-04	9	5.19	127
99SBOIA021	Trapper Cr	27	99-08-04	9	5.38	108
99SBOIA022	Quartz Cr	32	99-08-05	15	5.72	122
99SBOIA031	Fourmile Cr	21	99-08-30	12	5.4	101
99SBOIA032	Camp Cr	10	99-08-30	6	4.89	109
99SBOIA033	Fitsum	11	99-08-31	7	5.4	108
99SBOIA034	Caton Cr	24	99-08-31	M	M	M
99SBOIA035	EF SF Salmon	23	99-08-31	M	M	120
99SBOIA036	Lick Cr	9	99-09-01	13	5.77	113
99SBOIA045	Loon Cr	8	99-09-14	3	5.3	99
99SBOIA046	Pony Cr	3	99-09-15	8	5.72	100
99SBOIA047	Elk Cr	34	99-09-15	11	5.09	113
99SBOIA048	Blackmare Cr	14	99-09-16	10	5.61	97
99SBOIA049	Buckhorn Creek	12	99-09-16	7	5.23	108
99SBOIA058	Bear Creek	4	99-09-29	9	5.88	102

¹CWB = # of Cold water biota species present within the sample.

²MBI = Macroinvertebrate Score

³HI = Habitat Index

Table 20. Summer 2000 Macroinvertebrate Scores¹

Stream	MBI ²	CWI ³
Upper Trout	5.84	11
Lower Trout	3.91	2
Middle Sand	5.20	7
Lower Sand	5.42	2
Upper Bear	5.95	9
Lower Bear	4.20	6
Upper Dollar	6.33	11
Lower Dollar	5.67	9

Stream	MBI²	CWI³
Burntlog	<i>4.12</i>	8
EF Burntlog	<i>5.33</i>	10
Buck	<i>5.44</i>	8

¹Italic = MBI Calculator Version 3.1 used pending availability of the most recent MBI calculator.

²MBI = Macroinvertebrate Score

³CWB = # of Cold water biota species present within the sample.

As can be seen, the MBI scores for these streams, including Trout Creek, obtained during the summer of 2000 are above the 3.5 threshold value and are therefore considered “not impaired”.

Idaho Rivers Ecological Assessment

Rivers listed on the 1998 Idaho 303(d) list are to have the beneficial use support assessed using a “Large Rivers Protocol” (LRP). The SF Salmon River was utilized as a pilot site in the development of this protocol. Although still in draft form, preliminary findings for the SF Salmon River are presented to assist the IDEQ in determining the support status of these water bodies.

Data collected under the LRP for the SF Salmon River includes fish species presence and absence surveys, macroinvertebrate metrics, periphyton assemblages, and diatom assemblages. While the “a priori” classification for the SF Salmon River was “degraded”, each of the tools used to evaluate the current beneficial use support status within this water body showed “good” biological indicators. In fact, the results consistently indicate that the inputs of inorganic sediment to the SF Salmon River may not have impacted the aquatic macroinvertebrates (Royer et al., in review). Results of the LRP, therefore, indicate that the support status of the SF Salmon River hinges upon whether the river is able to support salmonid spawning and rearing.

Fish Species Presence and Absence - Salmonid Spawning and Rearing

Current IDEQ guidance for determining whether salmonid spawning and rearing is “impaired” vs “not impaired” depends upon either (1) a determination by IDFG that the water body either does or does not have a self-sustaining salmonid fishery, or, if no definitive finding has been reported, (2) data on salmonid populations. In the second case, the IDEQ is to evaluate the length frequency distribution data and determine if a minimum of three size classes are present. However, in the case of chinook salmon, young of year (YOY) and juvenile salmon provide an adequate indication that the spawning and some limited rearing is occurring, due to the transient nature of their stay within the SF Salmon drainage.

The IDFG and several cooperating agencies have conducted snorkel counts of chinook salmon, steelhead, cutthroat trout, bull trout, brook trout, and other fish species in the SF Salmon drainage. Referred to as the “parr” database, this data set was used to determine

whether at least 3 size (i.e. age) classes of a salmonid species was present within each sampled water body. Results of this data inventory are presented in Table 21.

Table 21. Parr Presence and Absence Data for the SF Salmon Subbasin

Stream	Chinook	Steelhead	Cutthroat	Bull Trout	Brook Trout	White fish	Redband
SF Salmon River	yoy + juvenile	yoy + 5	yoy + 5	4	yoy + 4	yoy + 6	
EF SF Salmon River	yoy + juvenile	yoy + 6	5	yoy + 6	yoy + 1	yoy + 5	1
Secesh River	yoy + juvenile	yoy + 4	yoy + 3	5	yoy + 4	yoy + 6	1
Johnson Creek	yoy + juvenile	yoy + 4	3	1	yoy + 3	yoy + 4	2
Dollar	yoy + juvenile	yoy + 3	3	2	4		
Lake	yoy + juvenile	yoy + 4	yoy + 1	4	yoy + 5	yoy + 5	2
Lick	yoy + juvenile	yoy + 4	yoy + 3	yoy + 2	yoy + 2	5	
Rock	yoy + juvenile	yoy + 1	yoy + 5	4	yoy + 4	yoy + 6	
Sand	yoy + juvenile	yoy + 2			yoy + 3		
Whisky	yoy + juvenile	1			yoy + 2		

Additional data collected by the USDA Forest Service was also examined for evidence of spawning and rearing support. Table 22 presents the results of this data review.

Table 22. Forest Service Presence / Absence Data for the SF Salmon Subbasin¹

Stream	Chinook	Steelhead	Cutthroat	Bull Trout	Brook Trout	Redband
Johnson Creek	yoy + juvenile		yoy + 3	yoy + 3	1	yoy + 3
SF Salmon River	yoy + juvenile	yoy + 3	2			
Buckhorn	yoy + juvenile	yoy + 2	yoy + 1	yoy + 3	yoy + 3	
Rice				yoy + 2		
Trib to Curtis				yoy + 2	2	
Pony	juvenile	yoy + 3	present	1		
Elk	juvenile	yoy + 3	present	2		
Trail		yoy + 3				
Warm Lake	yoy + juvenile		1	yoy + 3	1	yoy + 3

¹Numbers indicate the number of age classes found during survey.

As can be seen in Tables 21 and 22, all of the water bodies with existing fish presence/absence data meet IDEQ guidance criteria for full support for salmonid spawning and rearing.

Numeric Water Quality Data Indications of Support Status

The Idaho Administrative Procedures Act (IDAPA) 58.01.02.053 specifies that, when determining whether a water body fully supports designated and existing beneficial uses, the IDEQ is to determine whether all of the applicable water quality standards are being achieved in addition to whether a healthy, balanced biological community is present. Current guidance from the IDEQ indicates that the initial screen used to determine whether a water body is in violation of current water quality standards is primarily based on available monitoring data for the numeric water quality standards and the biologic life indicators present within the water body.

Turbidity

Idaho's numeric sediment standard for cold water biota place limits for water column turbidity to be 25 NTU above background for over a ten day period or 50 NTU at any time. Unfortunately, most of the sediment data that has been collected within the SF Salmon HUC only represents the total suspended sediment (TSS) or bedload. Also, rarely were the turbidity and the TSS data collected concurrently, thus limiting the IDEQ's ability to determine whether the TSS data indicated exceedances of the turbidity standards. Only a handful of samples with both turbidity and TSS analyzed were obtained. These data, from the Stibnite mine monitoring effort, were random grab samples collected during 1997 and 1999. These are presented in Table 23.

Table 23. Available Turbidity Data for the EF SF Salmon River, 1997 and 1999

TSS	Turbidity
7	41.6
9	49.1
1	9.3
3	70
65	78.1
4	43.5
11	113

A linear regression of these data results in the following relationship:

$$\text{Turbidity (NTU)} = 1.654(\text{TSS}) \text{ (mg/l)}; \text{ p-value} = 0.086$$

Using this relationship, the available ambient TSS data was analyzed (Table 24). Note that, of the water bodies with available TSS data, only Johnson Creek is currently listed on Idaho's 303(d) list.

Table 24. Turbidity Estimates based on Available TSS Data

Johnson Creek		Johnson near Yellowpine		WF Buckhorn		Little Buckhorn	
Date	Turbidity (NTU)	Date	Turbidity (NTU)	Date	Turbidity (NTU)	Date	Turbidity (NTU)
4/19/1993	12	4/19/1993	12	4/10/90	7	4/10/90	6
4/19/1993	12	4/19/1993	12	4/12/90	11	4/12/90	1
4/20/1993	21	4/20/1993	21	4/14/90	29	4/14/90	2
4/20/1993	21	4/20/1993	21	4/17/90	49	4/17/90	4
4/28/1993	10	4/28/1993	10	4/20/90	20	4/20/90	2
4/28/1993	10	4/28/1993	10	4/21/90	23	4/21/90	6
4/29/1993	12	4/29/1993	12	4/25/90	20	4/24/90	38
4/29/1993	12	4/29/1993	12	4/25/90	17	4/25/90	23
5/3/1993	3	5/3/1993	3	4/27/90	31	4/27/90	42
5/3/1993	3	5/3/1993	3	4/28/90	28	4/28/90	39
5/4/1993	5	5/4/1993	5	5/3/90	21	5/2/90	8
5/4/1993	5	5/4/1993	5	5/3/90	6	5/2/90	7
5/10/1993	30	5/10/1993	30	5/5/90	3	5/5/90	6
5/10/1993	30	5/10/1993	30	5/8/90	5	5/8/90	11
5/11/1993	20	5/11/1993	20	5/16/90	2	5/17/90	2
5/11/1993	20	5/11/1993	20	5/23/90	6	5/23/90	6
5/15/1993	7	5/15/1993	7	5/31/90	30	5/31/90	32
5/15/1993	7	5/15/1993	7	6/2/90	12	6/2/90	45
5/17/1993	3	5/17/1993	3	6/7/90	25	6/7/90	35
5/17/1993	3	5/17/1993	3	4/10/91	2	4/4/91	1
5/18/1993	5	5/18/1993	5	4/16/91	2	4/10/91	13
5/18/1993	5	5/18/1993	5	4/24/91	5	4/24/91	15
5/24/1993	5	5/24/1993	5	5/1/91	2	5/1/91	5
5/24/1993	5	5/24/1993	5	5/2/91	7	5/7/91	43
5/25/1993	5	5/25/1993	5	5/9/91	6	5/9/91	52
5/25/1993	5	5/25/1993	5	5/10/91	5	5/10/91	24
6/1/1993	5	6/1/1993	5	5/14/91	1	5/14/91	4
6/1/1993	5	6/1/1993	5	5/16/91	7	5/15/91	5
6/2/1993	5	6/2/1993	5	5/18/91	4	5/16/91	6
6/2/1993	5	6/2/1993	5	5/21/91	1	5/18/91	6
6/8/1993	3	6/8/1993	3	5/22/91	7	5/21/91	17
6/8/1993	3	6/8/1993	3	5/24/91	4	5/22/91	14
6/14/1993	3	6/14/1993	3	5/29/91	4	5/24/91	21
6/14/1993	3	6/14/1993	3	5/30/91	6	5/29/91	19
				5/31/91	2	5/30/91	9
				6/5/91	9	5/31/91	10
				6/12/91	5	6/5/91	31
				4/1/92	8	6/12/91	19
				4/8/92	13	4/8/92	1

Johnson Creek	Johnson near Yellowpine	WF Buckhorn		Little Buckhorn	
No Data	No Data	4/15/92	18	4/15/92	26
		4/21/92	16	4/21/92	20
		4/23/92	62	4/23/92	19
		4/28/92	3	4/28/92	45
		5/5/92	18	5/5/92	30
		5/7/92	20	5/7/92	45
		5/12/92	6	5/12/92	33
		5/14/92	3	5/14/92	4
		5/15/92	3	5/15/92	7
		5/21/92	3	5/21/92	21
		5/27/92	1	5/22/92	11
		5/29/92	1	5/27/92	13
		6/1/92	0	5/29/92	2
		4/14/93	3	4/22/93	7
		4/21/93	7	4/28/93	14
		4/22/93	18	5/7/93	10
		4/28/93	6	5/13/93	13
		5/7/93	2	5/19/93	26
		5/13/93	10	6/3/93	118
		5/19/93	19		
		6/10/93	2		
		6/16/93	20		
		6/17/93	3		

Assuming that the background levels of turbidity are approximately 20% of the measured values (especially during high flow and high turbidity time periods) the available data do not indicate any violations of the Idaho water quality standards for turbidity (Table 25).

Table 25. Turbidity Standard Attainment Summary

	Johnson Creek	Johnson near Yellowpine	WF Buckhorn	Little Buckhorn
Number of consecutive days above 25 NTU + Bkgd	0	0	0	8
Percent Above 50 NTU	0%	0%	0%	3%

Based on this limited amount of ambient TSS and turbidity data, the IDEQ does not consider turbidity as a pollutant of concern within the SF Salmon River HUC. Possible narrative sediment criteria violations for these and other water bodies are evaluated in a later section.

Metals and Toxins

As mentioned, mining has played a significant role in the human history of the SF Salmon Subbasin. The most extensive mining within the SF Salmon Subbasin occurred at the Stibnite mine located in the Upper EF SF Salmon River (Griner and Woodward-Cyde, 2000). The EF SF Salmon River, located adjacent to the Stibnite mine, was listed on the 1998 303(d) list for the State of Idaho.

The bulk of the monitoring data for mining impacts in the Subbasin is from Stibnite. Monitoring data exists from 1978 and an intensive site characterization was done in 1997 and 1999 as part of the reclamation effort. Long-term monitoring was implemented in 1999. The site characterizations included surface and ground water sampling; benthic invertebrate and fish sampling and soil sampling. Physical habitat was characterized during the aquatic sampling phase of the site characterization. As part of the Stibnite Characterization study from 1997-1999, Stibnite was divided into three sections (e.g. areas) based on geographical and operational history. The three areas are as follows:

Area 1: The Meadow Creek Valley;

Meadow Creek Mine

Historic Meadow Creek Mine Processing facilities

Historic Bradley tailing impoundments

Meadow Creek Mine hillside

Neutralized ore disposal area

Waste rock in valley floor

SMIT leach pads and cyanide plant

Hecla heap leach operations

Smelter stack ruins

Area 2: The EF SF Salmon River

Historic Bradley tailing below confluence with Meadow Creek

Former primary and secondary camps

Garnet Creek Pit

Defense Materials Exploration Administration dump

Area 3: Glory Hole

Historic Yellow Pine Mine (The Glory Hole pit) Historic Bradley waste rock dumps on the EFSFSR above and below the Glory Hole and on Sugar Creek

West End, Homestake and Midnight Pits

Historic Bradley Tunnel Outlet (BTO) on Sugar Creek

As part of the site characterization, three rounds of surface water sampling were performed in 1997 and four rounds were performed in 1999. In 1997, 29 stations were sampled and in 1999 24 stations were sampled. Table 26 lists and described the sample sites, and Figure 11 displays the sample site locations.

Table 26. Stibnite Monitoring Sample Sites

Site Location	Site ID	Site Description
Area 1		
Meadow Creek	Station 320	Meadow Creek reference station
Meadow Creek	Station 368	Historic Meadow Creek streambed below the Keyway but above the confluence with old Meadow Creek Diversion Channel. In 1999 due to relocation of Meadow Creek this station effectively located in mainstem of Meadow Creek.
Meadow Creek	Station 322	Below Meadow Creek Diversion Channel
Blowout Creek	Station BL-1	Blowout Creek, 25 feet upstream of confluence with Meadow Creek
Meadow Creek	Station MC-2A	Meadow Creek approximately 100 feet below the confluence with Blowout Creek
Meadow Creek	Station MC-2B	Meadow Creek near former location of Hecla Office
Meadow Creek	Station 319	Meadow Creek above the confluence with EFSFSR
Meadow Creek	Station MC-1A	Meadow Creek at the inlet from the upgradient wetland to the new Meadow Creek Diversion Channel
Meadow Creek	Station MC-1C	Meadow Creek Diversion Channel upstream of drainage from Keyway and near the plunge pool in the new Meadow Creek Diversion Channel.
Keyway	Station KW-1	Off-channel from Meadow Creek and directly downstream of the keyway in the Keyway Wetland./low flow
Upgradient Wetland by BT/No Disposal Area	Station UW-1	Stagnant area of the upgradient wetland at remnant tailing above the BT/No disposal area
Area 2		
EFSFSR	Station 315	EFSFSR approximately 1 mile above the confluence with Meadow Creek near the Site boundary. Reference station
EFSFSR	Station EF-2	EFSFSR above confluence with Meadow Creek.
EFSFSR	Station 313	EFSFSR at USGS gaging station
Garnet Creek	Station GC-1	Garnet Creek above Garnet Creek Pit. Reference station.
Garnet Creek	Station 318	Lower reach of Garnet Creek below pit.
EFSFSR	Station 310	EFSFSR below confluence with Garnet Creek
Fiddle Creek	Station FC-1	Fiddle Creek upstream of North Tunnel. Reference Station.
Fiddle Creek	Station FC-2	Fiddle Creek above confluence with the EFSFSR
EFSFSR	Station 324	EFSFSR below confluence with Fiddle Creek
Area 3		
Midnight Creek	Station MI-1	Midnight Creek above Upper Haul Road. Reference station.
Midnight Creek	Station 321	Midnight Creek above confluence with EFSFSR
EFSFSR	Station 369	EFSFSR downstream of Midnight Creek
Hennessey Creek	Station HC-1	Hennessey Creek reference station
Hennessey Creek	Station HC-2	Hennessey Creek above confluence with EFSFSR
EFSFSR	Station EF-7	EFSFSR near outlet from Glory Hole
EFSFSR	Station 308	EFSFSR below Glory Hole
Sugar Creek	Station 309	Sugar Creek above confluence with West End Creek. Ref. Sta.
West End Creek	Station 317	West End Creek above confluence with Sugar Creek
Sugar Creek	Station 307	Sugar Creek downstream of West End Creek
Bailey Tunnel Outlet	Station BTO	Outlet of historic Bailey Tunnel on Sugar Creek/low flow
Sugar Creek	Station 316	Sugar Creek above confluence with EFSFSR
EFSFSR	Station 314	EFSFSR downstream of Sugar Creek

Surface water quality was evaluated by comparing the chemical analytical results from 1996 compliance monitoring, 1997 and 1999 site characterization with Idaho and USEPA water quality criteria. Criteria for metals are based on dissolved concentrations except for aluminum, antimony, iron, mercury, and selenium. These criteria are based on the total amount present.

Monitoring results are extensively summarized in the 2000 Stibnite Report. A short summary of the monitoring data follows:

- In 1999, following the completion of the Bradley Tailing Diversion and Reclamation Project, concentrations of antimony and arsenic at each Meadow Creek and EFSFSR station were one to two thirds lower than 1997 levels. Mean concentrations ranged from 7-26 ug/l for total antimony and 32-60 ug/l for total arsenic.
- Some stations showed a 50% or greater decrease in these analytes. All sample results for dissolved arsenic were below the USEPA criterion.
- Hennessey Creek, Midnight Creek and the EFSF Salmon River below the Glory Hole had exceedances of the total antimony criteria. Also, there were exceedances at UW-1, KW-1 and BTO. Please note that these are all low flow sites adjacent or flowing into monitored creeks.
- Mercury levels were exceeded in Sugar Creek both at the reference station and stations in the mining activity area. Arsenic levels were only exceeded at the Keyway in 1999.
- Groundwater quality was shown to affect surface water quality in lower Meadow Creek. This is the area where the Bradley tailing is saturated or intermittently in contact with the water table.
- The study of seeps and springs showed similar results in that those seeps and springs in contact with the Bradley tailings had elevated levels of arsenic and antimony.

In spite of these exceedances, the trend since the 1997 site characterization is improved water quality at impaired sites based on water chemistry and benthic macroinvertebrate results. The most recent water quality samples, for example, were analyzed for comparison against the criteria for each metal. Dissolved metals indicative of impacts due to mining (antimony, arsenic, mercury and WAD Cyanide), while still present, have mainly been found at levels below state and federal acute criteria standards. In general, total and dissolved metals were below USEPA and state criterion and are declining with each year of sampling (Griner and Woodward-Cyde, 2000).

The 1999 bioassessment scores improved over the 1998 scores, and were in the moderate to high range of aquatic habitat complexity and integrity. Further, mayfly abundance and taxa richness were high indicating that metals levels were low since mayflies are metals sensitive. Since the reclamation is complete, sediment and metal concentrations should continue to decline. Long-term water quality monitoring is continuing (Griner and Woodward-Cyde, 2000).

Therefore, the current water body assessment for the EF SF Salmon River indicates that the aquatic environment in the majority of the creeks and streams that drain the Stibnite Site shows little or no evidence of current impairment from mining activities.

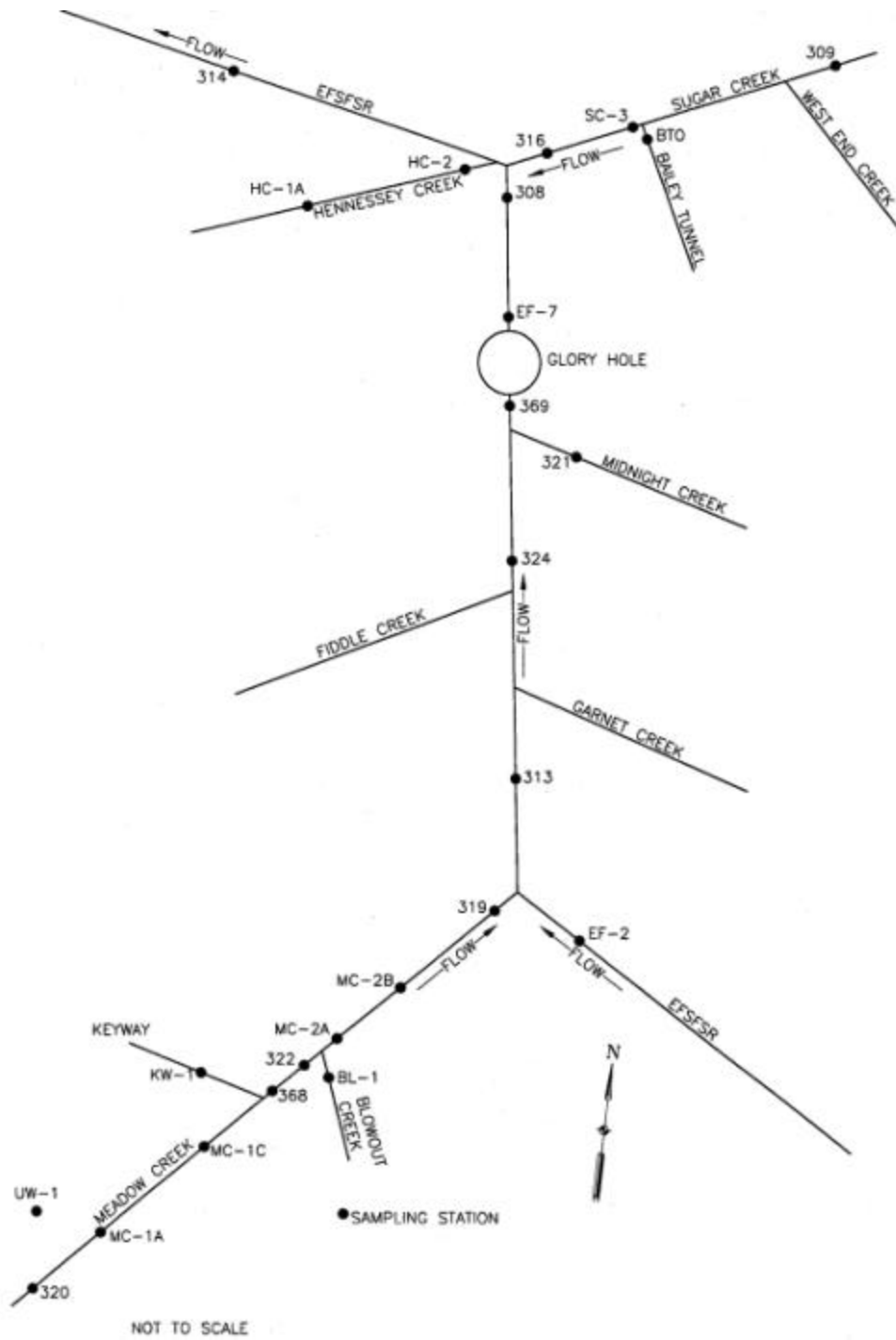


Figure 11. Stibnite Water Quality Monitoring 1999 Sample Stations

Stream Temperature

Numeric stream temperature criteria apply to streams in the SF Salmon Subbasin with existing and designated cold water or salmonid spawning and rearing populations. According to the IDAPA, all streams with these uses should not exceed the applicable state standards.

As also noted, however, a “natural background conditions” clause is to be used in the application of Idaho water quality standards. This clause states that: “Where natural background conditions from natural surface or ground water sources exceed any applicable water quality criteria as determined by the Department, that background level shall become the applicable site-specific water quality criteria. Natural background means any physical, chemical, biological or radiological condition existing in a water body due only to non-human sources. Natural background shall be established according to procedures established or approved by the Department consistent with 40 CFR 131.11. The Department may require additional or continuing monitoring of natural conditions.” The existing criteria are the applicable standard until such time as a “natural condition” or other criteria is established by the Department

None of the water bodies located within the SF Salmon HUC have been listed for temperature on Idaho’s 303(d) list. However, available stream temperature data from the USDA Forest Service show exceedances of both the State of Idaho and the federal stream temperature criteria for the beneficial use bull trout. All of the exceedances fall within the month of September. These exceedances and possible impacts to the riparian areas due to road encroachment are presented in Table 27. Other possible impacts to riparian conditions within the SF Salmon Subbasin are harvest methods that haul across the stream, high intensity fires within the riparian areas, and grazing.

Table 27. Summary of Available Stream Temperature Data and Possible Violations

Stream ¹	Forest	Listed for Sediment?	Temp Data?	Temp Excds? ²	Roads Located within RHCA?	Encroachment Found?
Trout	BNF	y	none	unk	y	y
Sand	BNF	n	97	y	y	y
Rice	BNF	y	none	unk	y	y
Trail	BNF	y	96; 99	y	y	y
Warm Lake	BNF	n	none	unk	y	y
<i>Lower Johnson</i>	<i>BNF</i>	y	<i>97; 99</i>	y	y	y
<i>Upper Johnson</i>	<i>BNF</i>	y	<i>97; 99</i>	y	y	y
<i>Upper SF Salmon</i>	<i>BNF</i>	y	<i>97; 99</i>	y	y	y
Tyndall	BNF	y	97	y	y	n

Stream ¹	Forest	Listed for Sediment?	Temp Data?	Temp Excds? ²	Roads Located within RHCA?	Encroachment Found?
Profile	PNF	n	94: 98	y	y	y
Buckhorn Creek	PNF	n	94; 98; 99	y	y	y
Lick Creek	PNF	n	93; 94; 98; 99	y	y	y
Summit Creek	PNF	n	none	unk	y	y
<i>EF SF Salmon River</i>	<i>PNF</i>	y	93: 94; 97; 98	y	y	y
<i>Middle SF Salmon</i>	<i>PNF</i>	y	94; 97; 98; 99	y	y	y
Grouse Creek	PNF	n	98; 99	y	y	n
Elk Creek	PNF	n	98: 99	y	y	m
Pony	PNF	n	98; 99	y	n	n
Sugar Creek	PNF	n	97; 98	y	n	n
Upper Secesh	PNF	n	94; 95; 96	y	n	n
Lake Creek	PNF	n	97; 98; 99	y	n	n

¹Italic = River, non-italic = Tributary

²unk = unknown

Of the possible management practices that may impact the riparian areas, and subsequent stream temperatures, only the possibility of road encroachment was evaluated. Other possible impacts were not evaluated due to the following reasons:

- The disturbance created by hauling timber across a water body impacts a limited stream length. Recent harvests include the 1996 helicopter harvest of a 250 acre parcel of private land on Profile Creek and post-1994 fire killed tree harvests from 1996-99. Only those impacts longer than 1000 feet (about 300 meters) were evaluated during the development of this SBA.
- Whether a current fire regime, or fire occurrence, is within or outside a natural disturbance pattern is an overly complex question to be addressed by the IDEQ at this time. This is especially true for riparian area burn intensities and occurrence under current management actions.
- Impacts from current grazing practices within the SF Salmon Subbasin are limited to the streams adjacent to the Hanson, Landmark, Josephine, Bear Pete, Marshal Mountain, and Victor Loon allotments. Data indicating Idaho water quality standard exceedances were not obtained for these water bodies during the development of this SBA.

An energy balance model (SSTemp) was used to evaluate the impacts road encroachment currently has on the stream shade quality and quantity, and subsequently stream temperature for those water bodies with a risk of “non-natural” riparian conditions (IDEQ, 2000b). Results of the model runs are presented in Tables 28 and 29. Stream temperature differences

presented are the differences between impacted (current) and un-impacted (natural) stream reaches under the same climatic conditions.

Table 28. Results for SSTEMP Analysis for Tributary Streams

Stream	Differences in Outflow Stream Temperatures			
	24 Hour		Equilibrium	
	Mean	Maximum	Mean	Maximum
Rice Creek	0.08	0.34	0.17	0.30
Trail Creek	0.10	0.34	0.17	0.28
Buckhorn Creek	0.05	0.53	0.21	0.37
Summit Creek	0.01	0.05	0.03	0.04
Lick Creek	0.06	0.34	0.14	0.24
Profile Creek	0.07	0.55	0.22	0.42
Warm Lake Creek	0.05	0.23	0.11	0.19
Trout Creek	0.41	0.99	0.54	0.94
Trib to Sand	0.17	0.39	0.20	0.34

Table 29. Results for SSTEMP Analysis for Rivers

Stream	Differences in Outflow River Temperatures			
	24 Hour		Equilibrium	
	Mean	Maximum	Mean	Maximum
Lower Johnson	0.03	0.27	0.33	0.60
Middle Johnson	0.25	0.57	0.29	0.49
Upper Johnson	0.32	0.70	0.37	0.64
Middle SF Salmon	0.05	0.22	0.17	0.32
Upper SF Salmon	0.02	0.24	0.31	0.55
EF SF Salmon	0.04	0.10	0.07	0.10
River				

These results indicate that increases in stream temperatures to the evaluated water bodies are either at or less than 1 °C during the time of criteria exceedances. These low increases in stream temperature fall within the possible error associated with estimated and measured parameters used in the SSTemp model (i.e. base flow, shade quality and quantity, etc.). Therefore, the stream temperatures obtained for these water bodies are considered to be reflective of natural conditions, and the Idaho water quality standards for streams with bull trout are not violated. However, the federal temperature standard for bull trout is exceeded. Therefore, the IDEQ places the evaluated water bodies listed in Table 27 on the 303(d) list for the State of Idaho based on federal bull trout stream temperature standard violations (i.e. no Idaho water quality standards are currently violated).

Support Status Under the Narrative Sediment Standard

The Idaho Administrative Procedures Act (IDAPA 58.01.02.053) specifies that, when determining whether a water body fully supports designated and existing beneficial uses, the IDEQ is to determine whether all of the applicable water quality standards are being achieved in addition to whether a healthy, balanced biological community is present. Current guidance from the IDEQ indicates that the initial screen used to determine whether a water body is in violation of current water quality standards is primarily based on available monitoring data for the numeric water quality standards and the biologic life indicators present within the water body.

However, under the current schedule, the State of Idaho is to re-visit, and possibly revise, the 1991 sediment TMDL approved by the USEPA. This earlier TMDL was developed by a consensus team with members from the USDA Forest Service, the USEPA, and state representatives. The team based their findings that the SF Salmon violated state standards under the narrative sediment standard. Under this TMDL the following sediment targets were established:

- 1) A 5-year mean of 27 percent depth fines by weight with no single year over 29 percent;
- 2) A 5-year mean of 32 percent cobble embeddedness, with no single year over 37 percent; or
- 3) Acceptable improving trends in monitored water quality parameters that “re-establish” the beneficial uses of the SF Salmon River.

During the development of these sediment targets, it was admitted that there was great uncertainty that the numeric targets selected would actually restore salmonid spawning in the river (i.e. to historic levels). Therefore, the stated objectives were to provide habitat “sufficient to support fishable populations of naturally spawning and rearing salmon and trout”. Ultimate achievement of water quality standards under this framework was based on data that indicated that naturally producing populations of chinook and steelhead “tolerant of sustained recreational harvest” were present.

Depth fines and cobble embeddedness data have been collected by the USDA Forest Service for sites within the SF Salmon Subbasin and within the Chamberlain Creek basin (Nelson et al., 1999a; Nelson et al., 1999b). Chamberlain Creek has been used to represent an “unmanaged” condition for comparison purposes. Five-year mean data for both of these targets are presented in Figures 12 and 13.

As can be seen in these figures, the apparent trend in depth fines (i.e. < 6.33 mm) is that they are increasing within the SF Salmon Subbasin, while decreasing within the Chamberlain Creek basin. The cobble embeddedness data show that embeddedness is nearly static at the EFSF Salmon site but is increasing slightly at the Chamberlain Creek sites.

One of the key factors in assessing the impacts of sediment, from both anthropogenic and natural sources, within the SF Salmon Subbasin is that the sediment is mobilized during episodic storm events. How the morphology and aquatic habitat within these water bodies respond to the volume of flow and sediment delivered during these episodic events determines whether the beneficial uses are impacted, and possibly impaired. Additionally, evaluating the relative magnitude of natural sources of flow and sediment within these water bodies compared to management sources is critical in evaluating whether the Idaho water quality standards are violated or not (i.e. under the “Natural Conditions” exemption in IDAPA 58.01.02.070.06).

Additional analysis of the depth fines for the smaller size particles (i.e. <0.85 mm) by Nelson (1999a) leads to the conclusion that, overall, progress has been made in restoring a great deal of resiliency to the systems. Supporting this conclusion is that the subbasin has experienced some potentially destabilizing events since 1994, but none have resulted in obvious deposition of fine sediments at the monitoring stations as occurred in 1965. However, the preliminary nature of these findings suggest that the third target (i.e., improved trends in monitored water quality parameters) and the overall target (i.e., to provide habitat “sufficient to support fishable populations of naturally spawning and rearing salmon and trout”) of the 1991 TMDL need to be included in the analysis of water quality standard and target attainment in this SBA.

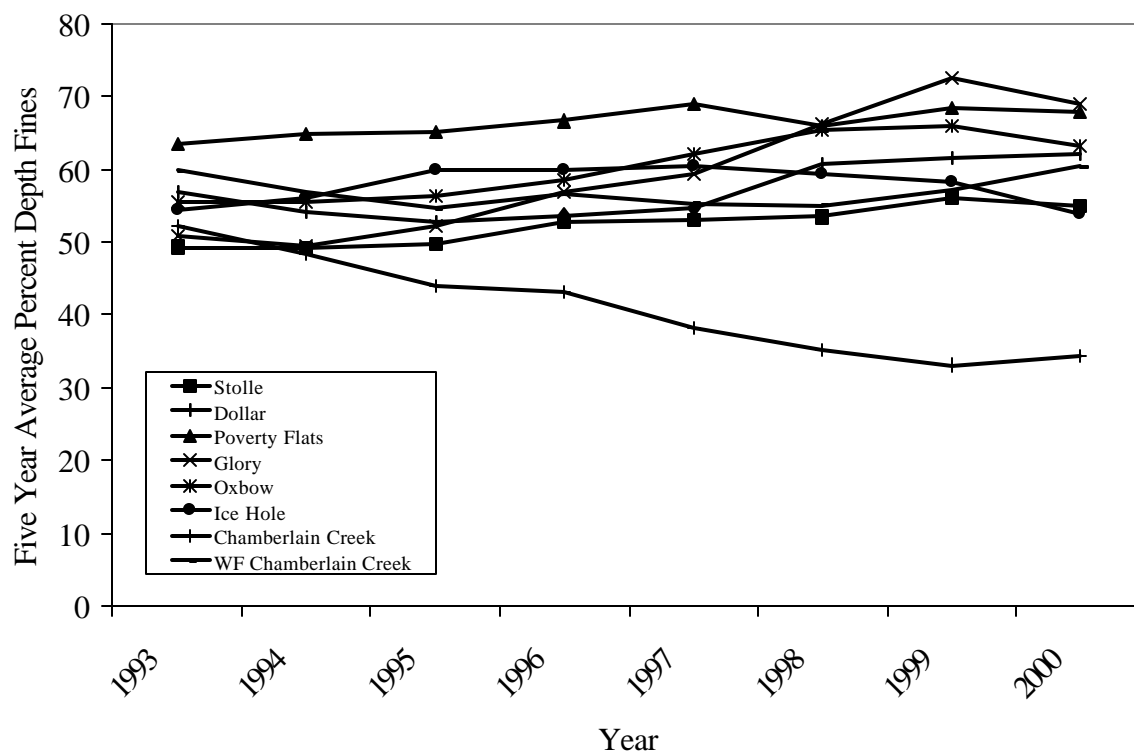


Figure 12. Five-Year Mean Percent Depth Fines for the SF Salmon and Chamberlain Basins

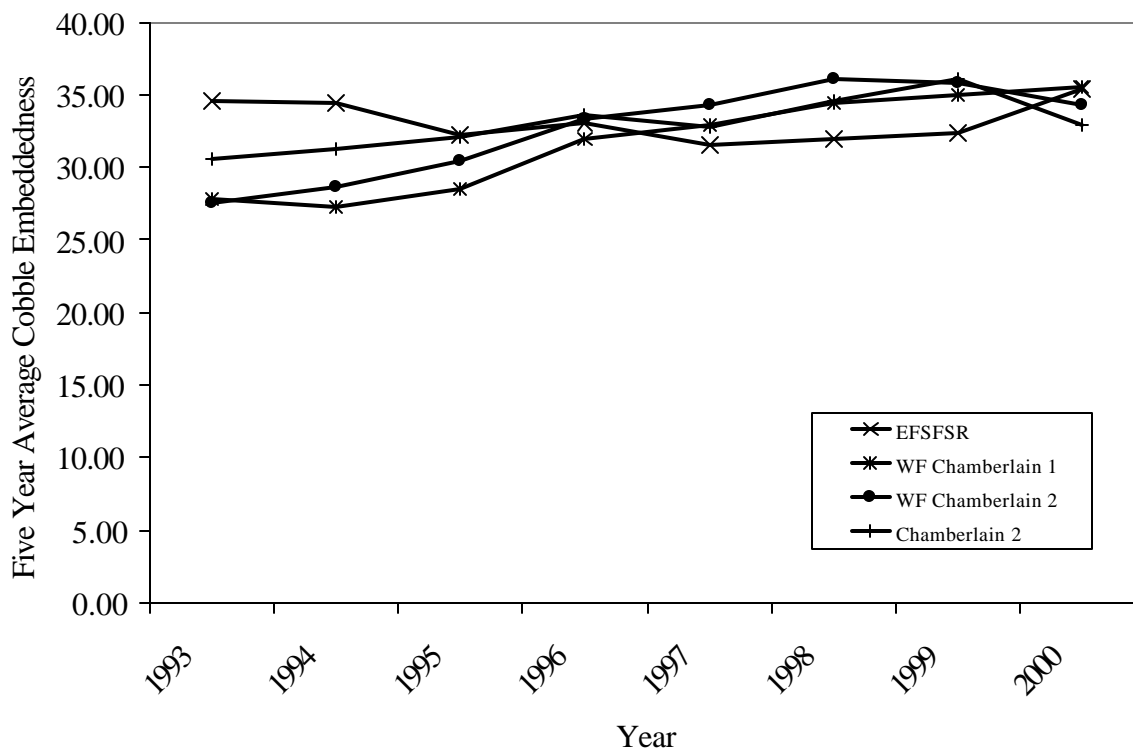


Figure 13. Five-Year Mean Cobble Embeddedness for the SF Salmon and Chamberlain Basins

In addition to these data, trends in Chinook productivity within the SF Salmon Subbasin is also useful. One available study compared the relative effects of the freshwater habitat available versus the migration corridor and ocean conditions on productivity of Chinook salmon (Lee et al, in review). The thrust of this study compared the return rates and productivity of Chinook salmon within the Middle Fork Salmon River (a largely un-managed basin) with the SF Salmon River. Preliminary results of this study indicate that the downstream stresses are the dominant cause of declining redd counts in the Salmon River system regardless of land use activities in the watersheds.

The study also found that the sedimentation in the SF Salmon Subbasin, due to land disturbance from 1949 to 1965, has been reduced since the initiation of the watershed restoration program in 1966. And, while this sediment reduction has met with moderate success in restoring productivity of the SF Salmon Chinook population, the analysis also suggested that roughly twice as many redds would have been observed in the SF Salmon between 1962 and 1989 had the habitat conditions been maintained at 1957 levels.

During another study the SF Salmon River mainstem was examined for changes in stream channel characteristics caused by the high magnitude flood and sediment delivery event that

occurred during the winter of 1996-97 (Johnson, 2000). This rain on snow event was estimated to produce a 20-year flood event for the SF Salmon mainstem. Changes in meso-scale hydraulic features, sediment distribution, and geomorphic channel dimensions were compared using three separate flights of multi-spectral airborne imagery (MSAI) (July 1992; November 1993; and October 1997).

It was found that the SF Salmon River remained resistant to changes caused by this large magnitude flood and sediment delivery event, with observed changes tending to be localized. With respect to the event examined, it is suspected that it assisted the SF Salmon River in reaching a state of improving dynamic equilibrium (i.e. where the rate of change is largely stable and favorable to the health of fisheries habitat) (Johnson, 2000).

Under the current guidance framework the IDEQ is to rely on available biological data to indicate the status of the water quality within these water bodies. And, as presented above, the BURP for streams and LRP for rivers indicate full support for these water bodies. Also, all of the recent studies available for the SF Salmon indicate that the historical habitat conditions are slowly re-establishing.

Water Body Assessment Summary

The 1996 Water Body Assessment protocol, plus other available data from cooperating agencies, is used here to determine the current beneficial use support status for these water bodies. The IDEQ and the USEPA will use the results of the water body assessments contained within this document to update Idaho's 303(d) list.

The review of the available ambient numeric water quality monitoring data shows attainment of water quality criteria for sediment and metals. Review of the biological data and sediment impacts to aquatic habitat indicates that the historical habitat conditions within SF Salmon Subbasin are in the process of re-establishing.

However, evidence remains that the existing road system contributes large quantities of sediment during storm events. These ongoing impacts to the water bodies, combined with the highly valued TES beneficial uses suggests that further implementation of the 1991 TMDL would be beneficial to prevent the existing roads and sediment sources from impacting current water quality. Therefore, the IDEQ is recommending additional actions be taken by the designated land management agencies to ensure the current water quality is protected and beneficial uses are supported in the future.

All of the larger water bodies within the SF Salmon Subbasin (e.g. SF Salmon, EFSF Salmon, Johnson Creek, and the Secesh River) are designated as Special Resource Waters (SRWs). SRWs are "those specific segments or bodies of water which are recognized as needing intensive protection to preserve outstanding or unique characteristics or to maintain current beneficial uses (IDAPA 58.01.02.002.96)". The State of Idaho Antidegradation Policy (IDAPA 58.01.02.051) for "high quality waters" also states that, "where the quality of the water exceeds levels necessary to support propagation of fish, ...that quality shall be maintained and protected."

Review of available ambient stream temperature data and site conditions indicates that the federal standards for bull trout are exceeded. Therefore, the IDEQ will place those water bodies on the State of Idaho 303(d) list (see Table 27 above).

2.4 Summary of Past and Present Pollution Control Effects

Point Sources

The only point source located within the SF Salmon Subbasin is the Stibnite mine along the EF SF Salmon River. Reclamation efforts at this site have been ongoing since the early eighties. As part of their operation in the Stibnite Area from 1982-1984, Canadian Superior reconstructed the Meadow Creek Diversion Channel around the Bradley Tailing impoundment. By building the keyway (earthen dam) at the base of the tailing impoundment they added structural stability, realigned lower Meadow Creek and covered the tailing in lower Meadow Creek with waste rock and other materials. These projects were designed to decrease the sediment load to Meadow Creek.

In 1996 and 1997, the discharge from Meadow Creek Ponds, behind the tailing impoundment was redirected and the diversion of Meadow Creek began but was not finished

Work done as part of the 1998 administrative order of consent included construction of a barrier against particulate migration; stabilization of Meadow Creek channel; stabilization of the exposed tailing and reduction of infiltration into the tailing.

In 1996, USEPA dealt with the tailings and landfill sites at Cinnabar Creek to minimize the amount of tailings and hydrocarbon contaminated soils coming into contact with surface water and surface water runoff. Cinnabar Creek was rip-rapped where it flowed through the south tailings impoundment.

Non-point Sources

The state has responsibility under Sections 401, 402 and 404 of the Clean Water Act to provide water quality certification. Under this authority, the state reviews dredge and fill, stream channel alteration and NPDES permits to ensure that the proposed actions will meet the Idaho's water quality standards.

Under Section 319 of the Clean Water Act, each state is required to develop and submit a non-point source management plan. Idaho's Non-point Source Management Program (currently in final draft September 1999) has been submitted to the USEPA for approval. The plan identifies programs to achieve implementation of BMPs, includes a schedule for program milestones, is certified by the state attorney general to ensure that adequate authorities exist to implement the plan and identifies available funding sources.

The Idaho water quality standards refer to existing authorities to control non-point pollution sources in Idaho. Some of these authorities and responsible agencies are listed in Table 30.

Table 30. State of Idaho's Regulatory Authorities for Non-Point Sources

Authority	IDAPA Citation	Responsible Agency
Idaho Forest Practice Rules	58.01.02.350.03(a)	Idaho Department of Lands
Rules Governing Solid Waste Management	58.01.02.350.03(b)	Idaho Department of Environmental Quality
Rules Governing Subsurface and Individual Sewage Disposal Systems	58.01.02.350.038	Idaho Department of Health
Rules and Standards for Stream-channel Alteration	58.01.02.350.03(d)	Idaho Department of Water Resources
Rules Governing Exploration and Surface Mining Operations in Idaho	58.01.02.350.03(e)	Idaho Department of Lands
Rules Governing Placer and Dredge Mining in Idaho	58.01.02.350.03(f)	Idaho Department of Lands
Rules Governing Dairy Waste	58.01.02.350.03.(g) or IDAPA 02.04.14	Idaho Department of Agriculture

The USDA Forest Service is responsible for administration, management and protection of approximately 98% of the land in the SF Salmon HUC. This agency has authority to regulate, license and enforce land use activities that affect non-point source pollution control from the following legislation:

- Taylor Grazing Act,
- Federal Clean Water Act,
- Federal Land and Policy Management Act,
- Public Rangelands Improvement Act,
- National Environmental Policy Act,
- Emergency Wetlands Resource Act,
- Agricultural Credit Act,
- Land and Water Conservation Act, and
- Executive Orders for Floodplain Management and Protection of Wetlands

The Forest Service has been addressing sediment load reductions in order to comply with the 1991 sediment TMDL. A list of identified sediment reduction projects yet to be completed

within the SF Salmon HUC was recently presented in the SF Salmon Subbasin Review (USDA Forest Service, 2000). Original opportunity lists developed after the approval of the 1991 TMDL were largely based on the SF Salmon River Restoration Strategy (USDA Forest Service, 1992). A list of sediment reduction projects implemented within the SF Salmon HUC is presented in Table 31.

Table 31. Sediment Reduction Projects Since the 1991 TMDL

Project	Forest	Area	TMDL Table 1	TMDL Table 2	SF Restoration Strategy	SF/JC Watershed Analysis	Forest Plan, WINI, EWP, TS	Status
Jakie Creek Face	Payette	Upper SFSR		1		1		Completed
Martin Creek Face	Payette	Upper SFSR		2		2		Completed, 1992
Poverty Burn	Payette	Upper SFSR		3	2	3		Ongoing
Indian Creek Trail	Payette	Upper SFSR		4		4		Completed, 1991
Fitsum Creek	Payette	Upper SFSR		5		5		Completed, 1992
Cougar Creek	Payette	Upper SFSR		6		6		Completed, 1997
Blackmare Creek Trail	Payette	Upper SFSR		7	15	7		Ongoing
White's Gully	Payette	Upper SFSR		8		8		Completed
Fitsum Creek Road	Payette	Upper SFSR		9		9		Completed
Cougar Creek Trail	Payette	Upper SFSR		10		10		Completed, 1991
Camp Creek	Payette	Upper SFSR		11				Completed
Jakie Creek Road Closure	Payette	Upper SFSR		12	18			Completed
Oxbow Breech	Payette	Upper SFSR		13				Pending
Remove 75,000 - 150,000 yards of sediment from SFSR using dredge or shovel loader	Payette/Boise	Upper SFSR		14	45			Pending
Spot Slide and Gully Stabilization	Payette	Upper SFSR		15		11		Completed
Bank Failure Below Jakie Creek Bridge	Payette	Upper SFSR		16		12		Completed
Salmon Point Slide	Payette	Upper SFSR		17		13		Completed, 1992
SFSR Road Reconstruction	Payette/Boise	Upper SFSR	1			14		Ongoing
Close Miner's Peak Road (Amended by Trail Conversion EA)	Payette	Upper SFSR	2		18	15		Completed, 1994
Temporary Closure of Buckhorn Rd.	Payette	Upper SFSR	3		19	16		Completed
Curtis Creek Drainage Spot Stabilization - Spur Road Obliteration	Boise	Upper SFSR	4		29	17		Completed, 1994
Two-Bit, Six-Bit Loop Rd. Stabilization	Boise	Upper SFSR	5			18		Completed
Upper SFSR Rd. (Kline Mt. Section) Obliteration/Spot Stabilization	Boise	Upper SFSR	6		27			Pending
NF Dollar Creek Road Obliteration/Spot Stabilization	Boise	Upper SFSR	7		32	19		Completed, 1993
Forest highway 22 Fill Stabilization	Boise	Upper SFSR	8		28			Pending
Road Closures in Upper SFSR	Payette & Boise	Upper SFSR	9			20		Completed, 1993
Basin Road Stabilization	Boise	Upper SFSR	10					Pending
Road Stabilization on Scotty Mine Rd.	Boise	Upper SFSR			31	21		Completed, 1992
Lunch Creek Road Closure	Boise	Johnson Cr.			36	22		Completed, 1991
Sheep Creek Road Closure	Boise	Johnson Cr.				23		Completed, 1991
SF Rice Creek Road Closure	Boise	Upper SFSR				24		Completed, 1993

Project	Forest	Area	TMDL Table 1	TMDL Table 2	SF Restoration Strategy	SF/JC Watershed Analysis	Forest Plan, WINI, EWP, TS	Status
SFSR Campground Stream Bank Stabilization	Boise	Upper SFSR			50	25		Completed, 1992
Rice Creek Stock Driveway Rehabilitation	Boise	Upper SFSR			5	26		Completed, 1993
Vulcan Springs/Trail Rehabilitation	Boise	Upper SFSR				27		Completed, 1993
Cabin Creek Campsite Rehabilitation	Boise	Upper SFSR				28		Completed, 1993
Molly Springs Trail Closure	Boise	Upper SFSR				29		Completed, 1993
Dollar Creek Road Closure	Boise	Upper SFSR				30		Completed, 1993
Golden Gate Road Area Gully Stabilization	Boise	Upper SFSR				31, JC-6,9		Completed, 1994
Closure of Road 409I, and 409J	Boise	Upper SFSR				32		Completed, 1994
Construct jetty or rip-rap stream bank above Oxbow to stop bank cutting	Payette	Upper SFSR			1			Ongoing
US Antimony abandoned mine site: improve drainage from open pit and reshape slopes	Boise	Johnson Cr.			7	JC-7		Pending
Improve side slopes of SF Salmon River at the Plunge	Boise	Upper SFSR			9			Ongoing
McCall-Yellowpine Road	Payette	Secesh / EFSR			11, 12, 13			Pending
Gravel 6 mile of Zena Creek Road	Payette	Secesh			14			Pending
Convert Hamilton Bar Road to Trail	Payette	Upper SFSR			16			Pending
Improve Road 340, Pony Cr.	Payette	Lower SFSR			17		TS	Ongoing
Rehabilitate Grouse Creek Road 325 near Sand Creek	Payette	Secesh			20			Pending
Improve Warren Wagon Road 21	Payette	Secesh			21, 22		TS	Completed
Improve Johnson Creek Road 674	Boise	Johnson Cr.			24, 25	JC-8		Ongoing
Obliterate E. Fork Burnt Log Road	Boise	Johnson Cr.			26	JC-10		Completed
Stabilize Cut/Fill on Tyndall Road 483	Boise	Johnson Cr.			30	JC-2		Ongoing
Improve Paradise and Power Line Road 448 & 467	Boise	Upper SFSR			33			Ongoing
Improve drainage and stabilize cut banks on road to Roaring Creek landing pad.	Boise	Upper SFSR			34			Completed
Stabilize and close Road 444 and improve 445, 449, 449B, 449C	Boise	Upper SFSR			35	JC-1		Completed
Improve & Obliterate portions of Thunder Mountain Road	Boise	Johnson Cr.			37, 38			Pending
Stabilize Hernessey Meadow Road	Boise	Johnson Cr.			39			Pending
Clean Spawning gravel in Lake and Summit Creek	Payette	Secesh			41			Pending
Stabilize stream banks and install fish rearing structures along Lake Creek and Upper Secesh River	Payette	Secesh			42			Pending
Remove debris from Summit, Lake and Grouse Creek	Payette	Secesh			43			Pending
Rip spawning gravels in SFSR with rock rake	Payette & Boise	Upper SFSR			44			Pending
Construct water-retaining structures in side channels of Lake Cr.	Payette	Secesh			46			Pending
Remove sediment from Rice Creek and Curtis Creek using a suction dredge	Boise	Upper SFSR			49			Completed
Stabilize Johnson Creek Stream banks	Boise	Johnson Cr.			51, 52			Ongoing
Stabilize old fish trap in Stolle Meadows	Boise	Upper SFSR			53			Ongoing

Project	Forest	Area	TMDL Table 1	TMDL Table 2	SF Restoration Strategy	SF/JC Watershed Analysis	Forest Plan, WINI, EWP, TS	Status
Thunderbolt KV cut/fill stabilization	Boise	SFSR / Johnson Cr.					TS	Completed
Pony Cr. KV/SI projects	Payette	Lower SFSR					TS	Ongoing
Big Flat KV/SI projects	Payette	Lower SFSR					TS	Ongoing
Elk Creek Road Reconstruction	Payette	Lower SFSR					TS	Ongoing
Ruby Meadows Road to Trail conversion	Payette	Secesh					Forest Plan	Ongoing
Bear Creek Road 359 improvements	Payette	Lower SFSR					WINI	Pending
Stabilize Davis Ranch Road	Payette	Lower SFSR					EWP	Ongoing
SFSR EWP	Payette	Upper SFSR					EWP	Ongoing
Stibnite	Payette	EFSFSR					EIS	Ongoing
Buckhorn EWP	Payette	Upper SFSR					EWP	Ongoing
Gully Stabilization Tyndall Meadows	Boise	Johnson Cr.				JC-3		Completed
McClure and Burntlog Trailhead relocation	Boise	Johnson Cr.				JC-4,5		Completed
Livestock Control in Sand Creek (C&H allotment)	Boise	Johnson Cr.				JC-11		Ongoing
Sand Creek	Boise	Johnson Cr.						Ongoing

2.5 Data Gaps

This assessment has identified data gaps that limit full assessment of beneficial use support status (Table 32). While the best available data was used to develop the current assessment, DEQ acknowledges that additional data would be helpful to validate or invalidate conclusions.

Table 32. Data Gaps Identified During the SF Salmon Subbasin Assessment

Portion of Assessment	Data Gap
Sediment	Additional turbidity data to validate the turbidity / TSS linear regression.
Fish	Additional data to validate the distribution and status of the fish species listed in Table 11.
Temperature	Additional temperature data for the streams (Table 27) exceeding the Federal Bull Trout temperature criteria.